Google

This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at http://books.google.com/

600030116H

G. 121. J. 12.
Plates. 7. 9. B. 18.

E. BIBL. RADCL.

19.
~~K. 2~~
~~19~~
~~J. 1 3.~~
~~9~~
14/
13/2
~~10~~
~~20. B. 29~~

19. K. 1-5.

16544 e. 181

C

A SYSTEM OF ANATOMICAL PLATES OF THE HUMAN BODY;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL & SURGICAL OBSERVATIONS,

BY

JOHN LIZARS F.R.S.E.

FELLOW OF THE ROYAL COLLEGE OF SURGEONS,

[illegible]

[illegible]

DEDICATED BY PERMISSION, TO

THE KING.

EDINBURGH:

[illegible] STREET;

[illegible]

[illegible]

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART I.—THE BONES.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

AND S. HIGHLEY, 174, FLEET STREET, LONDON.

1822.

EDINBURGH:
Printed by John Brewster,
11, Society.

TO

THE PUPILS,

WHO HAVE

INDULGENTLY LISTENED TO HIS INSTRUCTIONS,

THIS WORK

IS

HUMBLY DEDICATED

AS A MARK OF HIS ESTEEM AND REGARD,

BY

THE AUTHOR.

PREFACE.

THE Author has been induced to undertake this Work, chiefly because, if we except that of Caldani, which is so expensive as to be accessible only to a few individuals, we have hitherto no complete System of Anatomical Plates; and those Systems already published do not embrace Surgical Anatomy. To obviate the former of these evils, and to render the price of the present Work as moderate as possible, the letter-press has been printed in octavo size, which, in addition to the advantage of cheapness, will also be found more convenient for reference. The great aim of the Author being the most scrupulous correctness, he has either drawn the different objects himself, or superintended the drawings made by W. H. Lizars; so that by th

pencil of the one, and the careful superintendence of the other, he trusts the Plates will be found worthy of examination. At the same time he deems it proper to state, that he has availed himself of whatever advantages might be derived from the works of Albinus, Haller, Sue, Caldani, Cowper, Hunter, Vicq D'Azyr, Scarpa, and others.

The representations of the individual bones are given on as large a scale as the size of the Plates would possibly permit, in order to embrace all the points of reference; a method which the Author deemed preferable to making them bear a relative proportion to each other: indeed, the slightest comparison of the skeleton with the trunk and the individual bones, will at once show the folly of making any such attempt.

The descriptive part will be found to be assimilated to that of Monro Primus, whose work on Osteology still stands unrivalled, and whose method the Author has adopted ever since he has taught the science of Anatomy. Besides the bare description of each bone,—its uses, together with the accidents and diseases to which it is liable, are carefully detailed, in order that the student may be progressively conducted from the examination of the healthy,

to the consideration of the diseased structure, and that his mind may be constantly led to view each individual part as a living object, not as a dead inorganic mass. It is in this manner that the bones should be demonstrated as parts of the living system, nourished by vessels, and subject to the same changes and diseases as the other organs of the living body; otherwise, as an eminent surgeon judiciously observes, "all we have been examining is like dissecting a dead body without having any reference to the living, or even knowing it had ever been alive."

At the end of the description of the several bones, their formation, together with a more extended detail of the various diseases to which they are liable, is also given. On this part of the subject the Author has probably dwelt too long, but as he professes to give a succinct account of the present amount of our knowledge in Anatomy, Physiology, and Pathology, and as some of his ideas are new, and he trusts not unimportant, a little minuteness of detail seemed absolutely unavoidable, and will therefore, he thinks, be the more readily forgiven.

The terms *superior*, *inferior*, and others, refer to the natural and relative position of the bones them-

selves, rather than to the position which the rules of perspective rendered it necessary that they should sometimes assume in the drawings, which, however, have been so adjusted, that the terms apply almost invariably to both: for, when writing the description, the Author had the respective bones before him, by which means there is scarcely a point that is not represented in the Plates. Nevertheless, although in a work of this kind, considerable minuteness was necessary, the Author is far from advising beginners, to "commit to memory the numerous processes, grooves, and holes, many of which to know is of no importance, and to remember almost impossible:" the chief object of the student should be to familiarize his mind with those elevations, depressions, and foramina, which either elucidate a physiological fact, or bear some relation to Pathology or Surgery. It is only in this way that the extensive range of sciences connected with Medicine can be made subservient to any great or useful purpose, for if destitute and forsaken by natural philosophy, Medicine, says the father of science, is not much better than an empirical practice.

Such being the nature and object of this Work, the Author trusts he may be permitted respectfully

to offer it to the younger part of the profession, as likely to prove in some degree useful and instructive; and to the older, as at least a convenient book of reference.

39, *St. Andrew Square*,
November 1822.

CONTENTS.

	Page
Introductory Remarks,	1
Bones of the Skeleton, (Pl. I.)	3
Bones of the Trunk, (divided into) (Pl. II.)	3
Vertebræ, (Pl. II. figs. 2, 3, 4, 5, 6,)	4
Ribs, (Pl. II. figs. 7 and 8,)	10
Sternum, (Pl. II. fig. 1, letter *c*,)	13
Bones of the Pelvis, (divided into) (Pl. III.)	14
Os Sacrum, (Pl. III. let. *a*, and Pl. VIII. fig. 1,)	15
Os Coccygis, (Pl. III. letters *b*,)	17
Ossa Innominata, (divided into) (Pl. III. figs. 1, 2, 3, letters ʜ, ♄, *h*, ♄,)	19
Os Ilium, (Pl. III. figs. 1, 2, 3, *h*, and Pl. VIII. fig. 2,)	19
Os Pubis, (Pl. III. figs. 1, 2, 3, ♄, and Pl. VIII. fig. 2, ♄,)	22
Os Ischium, (Pl. III. figs. 1, 2, 3, ʜ, and Pl. VIII. fig. 2, ʜ,)	24
Remarks on the Pelvis,	27

	Page
Bones of the Head, (divided into) (Pls. IV. V. VI.)	28
Bones of the Cranium, (divided into) (Pl. V.)	28
Os Frontis, (Pl. V. figs. 1 and 2,)	29
Os Parietale, (Pl. V. figs. 3 and 4,)	32
Os Occipitis, (Pl. V. figs. 5 and 6,)	33
Os Temporis, (Pl. V. figs. 7 and 8,)	37
Os Sphenoides, (Pl. V. figs. 9 and 10,)	41
Os Ethmoides, (Pl. V. figs. 11 and 12,)	44
Remarks on the Bones of the Cranium,	45
Bones of the Face (divided into) (Pl. VI.)	48
Os Nasi, (Pl. V. figs. 13 and 14,)	48
Os Maxillare Superius, (Pl. VI. figs. 15 and 16,)	49
Os Lacrymale, (Pl. VI. figs. 17 and 18,)	53
Os Malæ, (Pl. VI. figs. 19 and 20,)	53
Os Palati, (Pl. VI. figs. 21 and 22,)	55
Os Spongiosum Inferius, (Pl. VI. fig. 23,)	57
Os Vomeris, (Pl. VI. fig. 24,)	58
Os Maxillare Inferius, (Pl. VI. figs. 25 and 26,)	60
Description of the Teeth,	62
Remarks on the cavities of the Nostrils,	58
Bones of the Upper Extremity, (divided into) (Pl. VII.)	64
Bones of the Shoulder, viz. (Pl. II. fig. 1. *p*, *k*, Pl. VII. figs. 1 and 2,)	64
Clavicle, and (Pl. II. fig. 1, *p*,)	64
Scapula, (Pl. VII. figs. 1 and 2,)	66
Os Brachii, (Pl. VII. figs. 3 and 4,)	69
Bones of the Fore-arm, (divided into) (Pl. VII. figs. 5 and 6,)	72
Ulna, and (Pl. VII. figs. 5 and 6,)	72
Radius, (Pl. VII. figs. 5 and 6,)	74
Bones of the Hand, (divided into) (Pl. VII. figs. 7 and 8,)	77
Bones of the Carpus (Pl. VII. figs. 7 and 8, letters *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*,)	77
Bones of the Metacarpus, (Pl. VII. figs. 7 and 8, dig. 1, 2, 3, 4, 5,)	81
Bones of the Fingers, (Pl. VII. figs. 7 and 8, dig. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,)	82

	Page
Bones of the Lower Extremity, (divided into) (Pl. VIII.)	84
Os Femoris, (Pl. VIII. figs. 3 and 4,)	84
Patella, (Pl. VIII. figs. 5 and 6,)	90
Bones of the Leg, (divided into) (Pl. VIII. figs. 7 and 8,)	91
Tibia, and Fibula, (Pl. VIII. figs. 7 and 8,)	91
	93
Bones of the Foot, (divided into) (Pl. VIII. fig. 9,)	95
Bones of the Tarsus, (Pl. VIII. fig. 9, letters *a*, *b*, *c*, *d*, *e*, *f*, *g*,)	95
Bones of the Metatarsus, (Pl. VIII. fig. 9, digits 1, 2, 3, 4, 5,)	100
Bones of the Toes, (Pl. VIII. fig. 9, digits 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,)	102
Physiological and Pathological Observations,	104
Formation of Bone,	104
Structure of Cartilage,	104
Formation of the Cranial Bones,	105
Formation of the Long Bones,	106
Nature of the Medulla of Bones,	106
Formation of the Teeth,	109
Pathology of Fetal Bones,	112
Pathology of Bones in Youth,	112
Pathology of Bones in Adult Life,	113
Pathology of Bones in Old Age,	113
Sensibility of Bone,	113
Vascularity of Bone,	115
Absorbents in Bone,	115
Pathology of irregularly round figured Bones, including Fracture, Inflammation, and Caries, with their treatment,	116
Pathology of long Cylindrical Bones, including Fracture, Inflammation, and Necrosis, with their treatment,	119
Pathology of Cranial Bones,	46
Exostosis, and its treatment,	124
Spina Ventosa,	125
Mollities Ossium,	125
Rachitis, and its treatment,	126
Fragilitas Ossium,	127
Anchylosis,	127

INTRODUCTORY REMARKS.

THE bones are the hardest and most solid organs of the system; they form the trunk around which the other organs are disposed, afford the necessary support to the rest of the body, and determine its size, proportion, form, and attitude. They are constructed of an osseous shell, with cancelli projecting inwards; a configuration which, independently of rendering them lighter, confers on them a greater degree of strength; for of two cylinders constructed of the same quantity of substance, the hollow is considerably stronger than the solid: the bones, in short, are the levers which, when articulated together, enable us by the aid of muscles to travel from the one end of the world to the other.

In the different classes of animals, and even in those which constitute the same class, the bones vary considerably. In the mammalia, great diversity is found: in man, for example, at an intermediate period of time, they acquire a sufficient degree of hardness, become perfected, and limit his growth; the lamellæ are thin and closely applied to each other, and the cellular texture is exceedingly delicate and filled with medullary pouches. In quadrupeds, the bones arrive at perfection in a shorter period of time, and the cellular structure is coarser than in man. In the cetaceous animals, the bones are exceedingly long

in attaining perfection, and their structure is still coarser than in quadrupeds; the large exterior fibres can be easily separated by maceration, and there are no large medullary cavities even in their long bones.

In the cartilaginous fishes, among which are the rays and sturgeons, the bones never become ossified; indeed, the bones of ordinary fishes, reptiles, and serpents, although they are ossified, still preserve greater flexibility than those in other species of animals; and the cartilaginous proportion greatly exceeds that in animals with red blood, hence they continue to grow almost throughout life, in consequence of this peculiarity of structure. In birds, the lamellæ are thin, firm, and somewhat elastic, and appear like layers glued upon each other; their bones are hollow, having the cavities filled with air, in consequence of a direct communication with their organs of respiration; and hence they are extremely buoyant. These are all the classes of animals which possess an internal skeleton surrounded by muscles. The others have merely a shell, within which are contained the soft parts as the testaceæ; or they have their bodies and members enveloped in scales articulated upon one another, as insects; or they are destitute of any hard structure whatever, as the soft worms.

The constituent principles of bone are, gelatin, cartilage, and phosphate of lime; the gelatin and cartilage constitute the animal property, the phosphate of lime the earthy property.*

The bones in the living state are invested with a vascular membrane named the periosteum.

* For further information respecting the chemical constituents of bone, consult Murray's or Thomson's Chemistry.

PLATE I.

THE bones which compose the skeleton, are divided into those of the trunk, letters *a*, those of the head, letters *b*, those of the upper extremity, letters *c*, and those of the lower extremity, letters *d*.

This Plate is taken from Albinus, and is merely intended as a diagram to the other Plates, and to represent the bones in connexion. If the bones of the head, pelvis, or any other part of the skeleton, are to be examined, the reader must turn to the Plates which illustrate these particular portions.

PLATE II.

THIS Plate represents the bones of the trunk in connexion, with individual specimens of the vertebræ and ribs. There are also attached to the trunk, the bones of the shoulder *p*, *k*. The representation of the trunk is taken from Sue, as it is the most correctly executed. The separate bones are drawn from nature. The trunk consists of the bones which compose the spine, the thorax, and the pelvis.

Fig. 1.—The letters *a*, and *g*, *g*, point out the spinal column; from the bone where the upper *a* is, to the bone where the lower *a* is placed, are comprehended the true vertebræ. The letters *g*, are placed on the false vertebræ of the column, or what is more generally named in the adult the os sacrum.

The os coccygis, the remaining portion of the column, and of the false vertebræ, is not in this view, but is seen in Plate III., *Figs.* 1, 2, 3, 4, letters *b*.

The true vertebræ are afterwards subdivided into those of the neck, or cervical, which are easily distinguished in the drawing by counting seven from the top, and terminate where the ribs commence; into those of the back, or dorsal, which are twelve in number, and are known by the ribs being attached to them; and into those of the loins, or lumbar, which are five in number, and are ascertained by counting five from the ribs to the false vertebræ or os sacrum. The false vertebræ will be described along with the other bones of the pelvis.

Each vertebra consists of a body, *Fig.* 2, *a*, and of a ring, *b*, *b*, which will be better understood in *Figs.* 5, 6, and 3, where complete circles are observed, and where the same letter is applied. From this ring arise seven processes, four of which are for articulation, and are named articular or oblique, letters *c*; and three for muscular attachment, or to give origin and insertion to muscles, two of which are denominated transverse, viz. that marked *d*, with the corresponding one of the opposite side, and the third is termed spinous, *e*, from which the whole chain of bones has derived its name. These processes are seen in the other vertebræ, *Figs.* 4, 3, 6, 5, where some are more distinctly marked, and where the same letters are placed on the same processes. Where the letter *b* is placed, there is a notch formed by this part of the ring, and which, with the contiguous vertebra, forms a hole that gives transmission to one of the nerves arising from the spinal marrow. In *Fig.* 1, several of the foramina formed by these notches are seen in the neck and loins, and are also marked *b*. There are twenty-four holes on each side formed by the true vertebræ, to afford a passage to the spinal nerves. *Fig.* 2 is a lumbar vertebra, and is known by its answering this general description, and having no marked peculiarities.

In the fetus at birth each vertebra consists of the body not fully ossified, and the ring divided into two parts, which are united to each other by cartilage; the junction of the two latter forming the spinous process: the articular processes are complete, but the transverse have only begun to be formed. I have not given a representation of a fetal bone, as it would have rendered the work too expensive, and as its condition can be easily conceived. In some malformations, there is a deficiency of one or more of the rudiments of the spinous processes; generally of the lumbar, sometimes of the sacral, but very rarely of the dorsal vertebræ: a tumor containing a clear fluid, analogous to that found in hydrocephalus, occupies the place of the spinous processes, and the disease is named spina bifida.

Fig. 3 is a representation of the inferior or sacral aspect of a cervical vertebra, and is distinguished from the others by having a foramen, *f*, in each transverse process, which transmits the vertebral artery and vein. The same letter is applied in *Fig.* 1. There are other peculiarities in this as well as in the other classes of vertebræ, but these it is unnecessary to notice here, as they are seen in the drawings. The inferior view has been chosen, as it shows the foramina more distinctly.

Fig. 4 is a dorsal vertebra, and is distinguished by having one or two depressions, *g*, *g*, on the sides of its body for articulation with the heads of the ribs. These depressions vary; thus, the first dorsal vertebra has a depression which receives the whole head of the first rib, and another depression which assists to form a cavity for the head of the second rib; the eleventh vertebra has often the whole cavity for the eleventh rib; and the twelfth always receives the whole head of the last rib. The others, as will be seen from the drawing, contribute, each to receive the heads of two ribs. Excepting the eleventh and

twelfth, the dorsal vertebræ have depressions, *h*, on their transverse processes, to which are articulated the tubercles of the ribs.

Fig. 5 is a representation of the first cervical vertebra or atlas, which differs from the others in having little or no body, and little or no spinous process, but a much larger ring. This is filled up in the fresh subject so as to correspond with the rest of the canal by the processus dentatus, *n*, of the second vertebra, *Fig.* 6. The letter *k* of *Fig.* 5, points to the smooth surface on which the processus dentatus revolves, and *i* points to the two small projections which give attachment to the transverse ligament that confines this process: the letter *i*, with the two lines, shows the direction of the ligament. Between these projections and the smooth surface *n*, is a rough sinuosity, *m*, *m*, giving attachment to the lateral ligaments, which extend between these points and the sides of the processus dentatus, and which are also connected to the margin of the foramen magnum of the occipital bone. The letters *f*, show the foramina in the transverse processes with the tortuous canals which are continuous: this circuitous course prevents the vertebral artery from throwing its blood with too much impetuosity into the brain, as well as guards against the too rapid descent of the blood by the vein, or the vessels being injured in the motions of the head and neck. The superior articular processes, *c*, *c*, are large oblong concavities fitted to receive the condyles of the occipital bone; and on these surfaces the nodding motions, or flexion and extension, are performed. In the fetal state, this vertebra also differs from the others; the circle is divided into two lateral pieces, and the part where the dentata revolves, and the spinous process, are both cartilaginous.

Fig. 6 is the second cervical vertebra, named vertebra dentata. The letters denoting the processes and foramina

common to the other cervical vertebræ, and to the vertebræ in general, remain the same in this drawing; *x*, indicating the processus dentatus from which the vertebra has derived its name. From the tip of this process extends the perpendicular ligament to be attached to the anterior margin of the foramen magnum of the occipital bone; from its sides the lateral ligaments extend to the atlas and occipital bone; and the transverse ligament of the atlas, which confines this process, forms a smooth surface on it posteriorly, while a corresponding one is formed anteriorly where it plays on the smooth surface of the body of the atlas. The superior articular processes, *c*, *c*, are large, oblong, slightly convex, and nearly horizontal, corresponding to the inferior of those of the atlas. From the foramina, *f*, *f*, are seen slight tortuous depressions made by the vertebral arteries and veins. In the fetus this vertebra consists of four pieces; the body and lateral pieces are the same as in the other vertebræ, but the processus dentatus is ossified in the centre, and joined by cartilage to the body like the lateral portions.

The vertebræ are connected to each other by cartilage and ligaments. The intervertebral cartilage is seen in *Fig.* 1, letters *o*, the letters pointing merely to that interposed in the lumbar region, as it is here better defined: this substance is nevertheless found between all the dorsal and cervical vertebræ; excepting between the atlas and dentata, where it is always deficient. The corresponding articular processes of every two contiguous vertebræ, are enveloped in a strong membranous ligament, named capsular; and as a joint is thus established, each articular process is tipped or covered with cartilage, styled perichondrium. A strong ligament, termed the common anterior, extends from the atlas to the os sacrum, on the anterior or sternal surface of the bodies; and beneath this, nearly

equally strong ligaments, named crucial or intervertebral, bind the margin of the one vertebra to that of the other. A ligament, denominated the common posterior, extends in a similar manner to the common anterior ligament, from the atlas to the os sacrum, behind the bodies of the vertebræ, or within the rings; and within this canal other strong ligaments are found, which connect the posterior arches of the vertebræ, and are named subflava. The vertebræ are also connected by strong ligaments passing between their transverse processes, termed intertransverse, and between their spinous processes, named interspinous ligaments. The vertebræ, by this junction through the medium of cartilage and ligaments, form a long canal which lodges the spinal marrow. Those portions of the vertebræ which are not covered by cartilage, or ligament, are covered by the membrane common to all the bones, named the periosteum.

This strong bond of union, through the medium of cartilage and ligaments, between the vertebræ, limits their motion; although at the same time they admit of flexion forwards, backwards, and to either side, with a slight rotatory motion. These movements vary in the different classes of vertebræ; thus flexion forwards is performed to the greatest extent by the cervical, next in degree by the lumbar, and, least of all, by the dorsal vertebræ. Flexions backwards and laterally take place in the same ratio. The rotatory motion is most evident in the lumbar region, next in degree in the cervical, and least of all in the dorsal; which motion, denied by some, is very evident in vaulters, in the Indian jugglers, and in some of the natives of Africa, who, in dancing to the guitar or strum-strum, exhibit the most fantastic figures. This rotatory motion is freely performed between the atlas and dentata; which, strictly speaking, is the only true distinct rotatory mo-

tion. In these motions, the intervertebral substance is a little compressed on the one, and elongated on the other side.

When the vertebræ are thus united, we observe several undulations or curvatures which tend to increase the strength and add to the grace of the column; and are apparently designed to support the head, the upper extremities, and the viscera. These curvatures of the spine are most remarkable in Europeans; for in the negro, there is no curvature of the loins; and in the lower animals, the curvatures of the spine differ more and more according to their gait.

As the vertebræ are, if we may use the expression, firmly locked together by their articular processes, by the intervertebral cartilage, by their strong ligaments, and by numerous muscles, they are almost incapable of dislocation. From their motions, the lumbar vertebræ are more frequently dislocated than either of the other two; and the cervical are next in liability to this accident. The dorsal have never been dislocated, nor has the atlas been separated from the occipital bone but by gradual disease.*

This intimate union of the vertebræ renders them much more liable to be fractured; and from their structure, as seen in Plate IV., *Fig.* 7, the fracture is transverse; in which circumstance they resemble soft wood, and soft minerals as lime or marle. When inflammation attacks them, it terminates either in resolution or caries; and when one is affected, the disease soon spreads to the contiguous vertebræ. Owing to their peculiar structure, they cannot exfoliate; neither can their vessels form an osseous shell, so as to constitute necrosis. They are particularly liable to

* Petit, Louis, Boyer, and C. Bell, have recorded instances of the dislocation of the atlas from the dentata; but the accident has almost immediately proved fatal.

caries, and in this they bear a close analogy to the soft parts. From the waving column formed by the vertebræ, and from the powerful muscles connected with them, the spine is peculiarly liable to distortion in feeble or scrofulous constitutions; and the open spongy structure of the bodies of the vertebræ causes absorption to go on rapidly in this affection.

The dorsal or thoracic vertebræ with the ribs, letters *c*, and sternum, letters *e*, constitute the osseous parietes of the thoracic cavity in which the chief vital organs are contained, viz. the heart and lungs.

The ribs are long curved bones, *Fig.* 1, letters *c*, situated on each side of the dorsal vertebræ, and extending in an arched form, towards the sternum, or breast bone, *e*, to which they are attached through the medium of cartilages, letters *d*. They are divided into true and false: the first seven, which are attached to the sternum by individual cartilages, are the true ribs; the remaining five are false ribs, the three first of which are attached by their cartilages to each other and to the seventh rib; the two last are supported by the abdominal muscles, and are named floating ribs.

Fig. 7 is a representation of a true rib being the seventh. We here observe the surface which looks towards the thoracic cavity, the osseous structure of which is formed by the ribs laterally, the dorsal vertebræ posteriorly, and the sternum anteriorly; we also perceive the two edges of a rib, the superior or atlantal *x*, and the inferior or sacral *a*, to which are attached the intercostal muscles; the letter *a*, however, points to a more important part, the groove made by the intercostal nerve, artery, and vein, (objects to be kept in view by the operator in performing paracentesis thoracis): the body or centre of the rib only being grooved. The letter *b* indicates the head of the rib, but only one

surface is seen where it is articulated to one of the two contiguous vertebræ; the other surface being easily understood from the wedge-like shape of the head, which forces itself into the intervening cartilage; and this, like all articular surfaces, is tipped with cartilage, and surrounded with a capsular ligament. The letter *c* points out the smooth surface, by which the rib is articulated to the transverse process of the lower of the two contiguous dorsal vertebræ; and the case is the same here as at the head of the rib, and with all other articulations: *d* is the tubercle of the rib, which is sometimes considered along with the smooth surface *c*; *e*, a small depression where mucilaginous glands are lodged; *f*, the angle of the rib; and *g*, the hollow spongy end which receives the cartilage, and which forms so firm a coalition as not to admit of any motion like a joint. The ribs are nearly completed at birth: the heads and tubercles have only larger cartilages on them, while the cartilages which connect them to the sternum are a little longer. These bones protect the heart and lungs, organs essential to life, and have been consequently completed by the great Author of Nature to preserve us from perishing at birth.

Fig. 8 represents the first rib, which differs from the seventh and the generality of the other ribs, by its surfaces looking upwards and downwards, or atlantad and sacrad, and by its edges outwards and inwards, or peripherad and centrad. This rib is therefore horizontal; and has on its upper surface a peculiar tubercle *h*, which gives attachment to the scalenus primus or anticus muscle, near which is a slight grooved depression *i*, made by the subclavian artery as the vessel passes out of the thorax. This tubercle should be carefully attended to by the operator, for by means of this and the other directions given in Part III., page 70, the taking up the subclavian artery is rendered one of the sim-

plest operations of surgery. The letter *k* points to the head of this rib, which differs from the others by being round, as it is attached only to the first dorsal vertebra. The cartilage of this rib is generally ossified in adults.

The ribs are articulated by their heads to the sides of the bodies of every two contiguous vertebræ, excepting the first and last, the former of which I have already taken notice of; the latter is attached only to the body of the twelfth dorsal vertebra. They are also articulated by the smooth surfaces of the tubercles to the transverse processes of the lower of the two vertebræ, excepting the first, which is articulated to the first dorsal vertebra, both at its body and transverse process; also, excepting the eleventh and twelfth, and sometimes the tenth, which have no depression for articulation to the transverse processes of the vertebræ. The ribs are joined anteriorly to their cartilages, which are articulated to the sternum.

On viewing the ribs, we observe that the first is the most curved, but that they increase in their obliquity to the spine on their descent, so that their cartilages make a greater and greater curve in their progress to the sternum. They also increase in length from the first to the seventh; and from that to the twelfth they gradually diminish.

The ribs are so strongly articulated to the bodies and transverse processes of the vertebræ, and supported by so many muscles, particularly short ones, that they are scarcely ever displaced at this extremity; their elasticity also tends to prevent dislocation either at this end or at their sternal extremity; this, however, sometimes occurs, although they are much more liable to be fractured; and, from their structure being analogous to the section of the thigh bone, delineated in Plate IV., *Fig.* 10, its direction will depend on the part of the rib which sustains the injury: for the extremes resemble the bodies of the verte-

brae, and hence the fracture at either of these is transverse; while the body or centre of the bone being dense like that of the thigh bone, its fracture is oblique and splintery; in which latter they resemble hard wood, and hard and compact minerals. The splintering fracture of the ribs frequently gives rise to fatal symptoms, and should therefore be well considered by the practitioner.

When inflammation attacks the ribs, the disease terminates either in resolution or in caries; and when either of the extremes, particularly the sternal, is the seat of inflammation, caries is the general termination, and this is often accompanied by carious ulcer of the sternum. The centre of the bone is so dense that it seldom ulcerates; and there is no instance recorded of the ribs undergoing necrosis, although their structure resembles the bones subject to this disease. In scrofulous constitutions, the cartilages are easily distorted, and soon involve the sternal extremities.

The sternum or breast bone, letters *e*, *Fig.* 1., is situated in the anterior part of the trunk, or more correctly, the thorax; and is in a manner wedged between the cartilages of the ribs. The sternum is a long flat bone, slightly convex outwardly, and concave, particularly its upper extremity, inwardly, or where the bone looks towards the thoracic cavity; and consists of three portions, on which the letters *e*, are placed: the upper, or atlantal, is of a heart-shape, supports the clavicles, *p*, *p*, and receives the whole of the first and the half of the second rib; and at each of these points there are corresponding depressions; those for the clavicles are the largest, and, in the fresh subject, interarticular cartilages are here interposed. The second, or middle portion of the sternum, receives the remaining half of the sternal extremity of the second rib, the whole

of the third, the fourth, fifth, and sixth ribs, and the half of the sternal extremity of the seventh rib. The third, or inferior, or sacral portion is generally named cartilago ensiformis, or xiphoides, from its continuing long cartilaginous; this receives the remaining half of the seventh rib. In the fetus, the sternum generally consists of four small round bones surrounded with cartilage; but these vary in number. The sternum is one of the best specimens of the formation of bone.

The sternum, from its attachments, is never dislocated, although from its consisting of three portions which do not unite by ossification till mature age, we should apprehend that one portion might be displaced from another; accidents, however, either produce fracture, or cause inflammation; and as this bone has the same structure as the body of a vertebra, *Fig.* 7, Plate IV., the fracture is transverse. For the same reasons, when inflammation attacks this bone, the disease terminates generally in caries; a frequent occurrence in the scrofulous habit. This bone is subject to exostosis, particularly the syphilitic. In consequence of remaining long chiefly cartilaginous, the sternum is easily distorted in the rickety constitution.

In *Fig.* 1, *g*, *g*, point out the os sacrum or part of the false vertebræ, and the letters *h* the ossa innominata, which, with the os coccygis, constitute the bones of the pelvis.

PLATE III.

In this plate we have representations of the female and male pelvis, and of that of the fetus. *Fig.* 1 is the female, *Fig.* 2 the male, and *Fig.* 3 the fetal. The same letters apply to *Figs.* 1, 2, and 3.

The pelvis is composed of the os sacrum, *a*, *a*, the os coccygis, letters *b*, and the ossa innominata, letters *h*.

The os sacrum consists of a body, *a*, *a*, which, in *Fig.* 3, is better defined, as the bone in the fetus consists of five distinct vertebræ; and four transverse lines are seen in the two adult pelves, where the cartilage existed in the early state. The letter Y, *Figs.* 1 and 2, is named the promontory, which, with the white line, *y*, *y*, *y*, *y*, *r*, *r*, extending around the pelvis, forms the brim or inlet of the pelvis. The rings, which are seen posteriorly, or dorsad, are ossified together so as to form the termination of the canal for the spinal marrow here named cauda equina; and the letters, *l*, *Fig.* 1, Plate VIII., indicate the beginning and end of this tube, formed by the sacrum. The os sacrum consists also of articular processes, *c*, *c*, which are connected to the two inferior articular processes of the last lumbar vertebra; the other articular processes are soldered together so as to form an irregular indistinct ridge, or a series of tubercles on the posterior or dorsal aspect of the bone seen in Plate VIII. *Fig.* 1, letters *c*. The sacrum has also transverse processes which are likewise soldered together: the three upper form an oblong process, *d*, *d*, *Fig.* 1, Plate VIII., which is divided by a long perpendicular ridge into two irregular depressions; the anterior or pubic is smoother, tipped with cartilage in the fresh state, and articulated to a corresponding surface of the os ilium; and this junction is styled the sacro-iliac synchondrosis. The manner of articulation is seen in Plate III. *Figs.* 1, 2, and 3, at *f*, *f*. The posterior or dorsal depression gives attachment to strong ligamentous bands, which pass between the sacrum and os ilium. The two lower transverse processes, *g*, *g*, *Fig.* 1, Plate VIII., form a tubercle and oblong flat surface, to which are attached the two sacro-ischiadic ligaments. The spinous

processes are more distinct, and form nearly a continuous ridge, as seen in Plate VIII. *Fig.* 1, letters *e*. The two superior letters *n*, *Fig.* 1, Plate VIII., and *Figs.* 1, 2, and 3, Plate III., point out the notch which, with the last lumbar vertebra, forms a foramen, as seen in Plate II. *Fig.* 1; and the same letters mark the foramina in the sacrum corresponding to this, which transmit the large sacral nerves that supply the lower extremities. Similar foramina are seen on the posterior or dorsal aspect in Plate VIII. *Fig.* 1, letters *n*, which give exit to much smaller nerves. The letters *x*, *Fig.* 2, Plate III., show the origin of the pyriformis muscle of one side.

The os sacrum is articulated superiorly, or atlantad, by its body, to the inferior surface of the body of the last lumbar vertebra, by intervertebral cartilage; and, by its proper articular processes, to the two inferior articular processes of the same vertebra by capsular ligaments. Laterally, this bone is joined by the anterior smooth oblong process, *d*, *d*, placed on the left side of *Fig.* 1, Plate VIII., to a corresponding surface of the os innominatum, or os ilium, as seen in Plate III., *Figs.* 1, 2, and 3, letters *f*. This is covered with cartilage in the fresh state, and is named the sacro-iliac synchondrosis. The letters *d*, on the right side of *Fig.* 1, Plate VIII., show the posterior rugged surface where this junction is strengthened by ligaments passing between the sacrum and os ilium posteriorly. In some aged subjects, this junction is ossified, and, in this state, constitutes anchylosis. The sacrum is articulated inferiorly, by cartilage and ligaments, to the body of the os coccygis; and this articulation, which is seen in Plate III. *Figs.* 1, 2, and 3, at the lower *a*, becomes also, in advanced life, very frequently anchylosed.

The sacrum, we have already observed, lodges the termination of the spinal marrow named cauda equina, and transmits through its foramina the nerves which form this bush: it serves also as the common base and support of the trunk of the body, forming the greater portion of the lower pyramid. The back or dorsal portion of the pelvis, which is enlarged by its curved shape, thus giving support to the viscera in this cavity, is likewise formed by this bone; and its rugged, convex, posterior aspect affords strong origin to the several muscles which move the trunk and thigh. The upper attachment of this bone to the last lumbar vertebra admits of motion analogous to the other vertebræ, and is, therefore, seldom or ever dislocated; the few cases on record show that when this accident did occur, it soon proved fatal. However, from the examination of a number of female subjects who died immediately after childbirth, I observed a relaxation of this junction amounting in some to partial displacement, so that I am inclined to give credit to the statements of the older anatomists, Vesalius, Riolanus, Bauhinus, Diemerbroek, Harvey, Spigelius, and Ruysch. The articulation with the os coccygis is sometimes dislocated in parturition.

The sacrum, in its structure, corresponds with the vertebræ, but is fully more spongy and lighter; and its fracture is transverse, but the injury requisite to effect this must be so severe, that the bone is generally broken in fragments. This bone is subject to the same diseases as the other vertebræ; and frequently becomes carious from long confinement to bed, in consequence of other diseases.

The os coccygis, letters *b*, *Figs.* 1, 2, and 3, forms the termination of the spinal column, is the apex of the lower pyramid, and consists of four small pieces, as seen in

Fig. 4, marked with the letters *b*; the two latter being generally united into one. In old people all the pieces become anchylosed, and frequently even the junction with the os sacrum anchyloses, so as to form one continued bone; while, on the contrary, in the fetus, they are nearly all cartilaginous. The upper, or first bone, as well as the others, has a body analogous to that of the other vertebræ, the letter *b*, being placed on this part in *Fig.* 4, which has a similar surface to the other vertebræ, and is covered with cartilage in the fresh state, and articulated to the lower point, *a*, of *Fig.* 1, Plate VIII. This portion has projections, *c*, *c*, analogous to the articular processes, which are frequently joined, either by cartilage or bone, to the lowest corresponding articular processes, *c*, *c*, of the os sacrum, *Fig.* 1, Plate VIII.; and through the apertures, or under the arches thus formed, the twenty-ninth pair of spinal nerves pass out. This piece has likewise two lateral projections, *d*, *d*, named shoulders, analogous to the transverse processes; and at the root of each of these is a small notch, *n*, *n*, where the last pair of spinal nerves emerge. The distal, or lower, end is convex, and is received into a corresponding depression of the second bone, which resembles the same surface of the first bone; and here, as between the others, an intervertebral cartilage exists. This, and the other pieces are similarly formed, and evidently admit of motion on each other, and the first on the sacrum. Though well strengthened by ligamentous covering and muscles, they are sometimes dislocated backwards in parturition; and in the case of a parturient female advanced in years, this bone is sometimes fractured; which shows the necessity of the accoucheur supporting properly the perineum in this process of nature. The os coccygis is also sometimes dislocated towards the pelvis

by a blow or fall, and is subject to the same diseases as the os sacrum. Boyer describes this bone fractured in advanced life by a fall on the nates.

The os coccygis contributes to form what is named the outlet of the pelvis, supports the rectum and other pelvic viscera, and yields in the expulsion of the feces, and in parturition.

The ossa innominata, *h*, *h*, ♄, ♄, H, H, *Figs.* 1, 2, 3, Plate III., constitute the rest of the pelvis, and form the lateral and anterior parietes of the cavity, as also the inferior and lateral walls of the abdomen. Each os innominatum, as seen in *Fig.* 2, Plate VIII., is divided into the os ilium *h*, *h*, *Figs.* 1, 2, and 3, of Plate III.; into the os pubis, ♄, ♄, of the same figures and same plate; and into the os ischium, H, H, of the same plate. The division, or union, takes place at the cavity named acetabulum, *r*, *r*, which is only seen distinctly in the fetal pelvis, *Fig.* 3.

The os ilium, which forms the upper portion of the bone, is concave where the letters *h*, *h*, in *Figs.* 1 and 2, Plate III., are placed. This is named the venter of the bone, and is covered by the iliacus internus muscle in the fresh state, to which it affords origin or attachment, contributing also from its shape to support the abdominal viscera. Superiorly this flat and slightly concave surface terminates in a semicircular edge, s, s, *Figs.* 1, 2, 3, Plate III., also *Fig.* 2, Plate VIII., which is named the crista ilii, is tipped with cartilage in the fresh state, and gives attachment to the three lateral muscles of the abdomen, to some of the muscles of the back, and to part of the gluteus maximus and medius muscles. This crista terminates anteriorly and posteriorly, in a small projection, denominated spinous process; *s*, of *Figs.* 1, 2, 3, of Plate III., and of *Fig.* 2, Plate VIII., indicates the anterior superior, that gives origin to the sartorius muscle;

while *f*, *Fig.* 2, Plate VIII., indicates the posterior superior spinous process which gives origin to muscles of the back, and to strong ligaments proceeding to the transverse processes of the two lower lumbar vertebræ. Proceeding downwards from the anterior superior spinous process, the bone is a little concave, and then terminates in a similar protuberance *t*, *Figs.* 1 and 2, Plate III.; and *Fig.* 2, Plate VIII., named the inferior anterior spinous process: from this arises the rectus muscle of the thigh. The concavity between these two processes is occupied partly by this muscle, and partly by the sartorius. A corresponding process, styled the posterior inferior spinous, is seen in Plate VIII., *Fig.* 2, letter *v*.

On the inside of the anterior inferior spinous process is a gentle depression, or groove *x*, *Figs.* 1 and 2, Plate III., made by the iliacus internus muscle, and the psoas magnus muscle, in their passage out of the abdomen to the thigh bone. The anterior crural nerve, artery, and vein, which rest upon these muscles, emerge along with them.* Towards the interior or centre of this depression, and venter of the ilium, there is a ridge, *y*, *y*, of *Figs.* 1 and 2, Plate III., continuous with one of the pubis *z*, and also with one of the sacrum Y, which is termed the brim or inlet of the pelvis; that of the ilium and pubis is styled the linea-ileo-pectinea; and into the iliac portion the tendon of the psoas parvus is inserted.

On the dorsal aspect, named the dorsum of the bone, which is seen in Plate VIII., *Fig.* 2, there are several ridges and depressions made by the three glutei muscles; the letters *a*, near the posterior superior spinous process, mark the surface occupied by the gluteus maximus; the

* This should be considered by the practitioner in reasoning on crural hernia, for these objects, assisted by the external oblique muscle, shut up the abdomen at this point.

letters *b*, the surface which gives origin to the medius; and the letters *c*, that which gives attachment to the minimus: thus a short ridge is formed between the surfaces occupied by the maximus and medius; a long ridge between the medius and minimus, which extends from the anterior superior spinous process to the great sacro-ischiadic notch; and a third is formed by the action of the minimus, which stretches from the inferior anterior spinous process to the same notch. The surface *e*, *e*, *e*, gives attachment to the capsular ligament of the hip joint. The letter *d* points out the spot occupied by the tensor vaginæ femoris, so that the sartorius, the tensor, and gluteus medius muscles, are on the same level. Parallel to the posterior or sacral margin of the gluteus medius, arise some of the fibres of the pyriformis muscle, which is marked *z*, to show that it is the same object which arose also within the pelvis, from the os sacrum, between the anterior foramina, as seen in Plate III., *Fig.* 2. A number of small foramina are seen on the dorsum of the bone which transmit nutritious vessels; and a conspicuous one is generally found on the venter near the linea-ileo-pectinea.

The os ilium has a smooth surface tipped with cartilage, which corresponds to that marked *d*, *d*, on the left side of the os sacrum, *Fig.* 1, Plate VIII., by which it is joined to this bone, as represented in Plate III., *Figs.* 1 and 2, *f*, *f*, named sacro-iliac-synchondrosis; and there are corresponding inequalities to those of the os sacrum, where the ligamentous bands are attached. The os ilium is joined also to the os pubis and os ischium, at the acetabulum, by cartilage in the fetus, as represented in Plate III., *Fig.* 3, letters *r*, *o*; and this cartilaginous bond of union becomes completely ossified in the adult, so as to form one bone, as seen in Plate VIII., *Fig.* 2. The pro-

portion of the acetabulum which the os ilium forms, is a little less than two-fifths, as seen at *r*, *Fig.* 3, Plate III. Here we observe that the large cartilaginous mass, and the crista which is afterwards united to the bone in the form of an epiphysis, are cartilaginous.

Under the description of the os sacrum, I have remarked, that, in several female subjects, who died immediately after parturition, there was a separation of the os ilium and sacrum at the sacro-iliac-synchondrosis. Excepting in childhood, no separation or dislocation between the os ilium and ischium, or pubis, can occur at the acetabulum.

This, although a flat bone, resembles in its structure the round bones, as, for example, the bodies of the vertebræ, seen in Plate IV., *Fig.* 7; its fracture, therefore, is transverse: but this never occurs, excepting in cases similar to those mentioned under the os sacrum. The os ilium is subject to the same diseases as the bodies of the vertebræ, and is rendered carious, sometimes in lumbar abscess, and sometimes in aneurism of the external iliac artery.

The os pubis ♄, *Figs.* 1, 2, and 3, Plate III., and *Fig.* 2, Plate VIII., forms the anterior portion of the pelvis; the letter ♄ is placed on the body; *t*, in *Figs.* 1 and 2, of Plate III., indicates the crista which gives origin to the pyramidalis and rectus abdominis muscles, and insertion to part of the tendon of the external oblique muscle; the crista terminating outwardly in a small tubercle termed the spine *t*, into which also the tendons of the external and internal oblique muscles are inserted.* Running round the upper edge of the bone, from the spine of the pubes to the os ilium and os sacrum, there is a ridge *p*, which is the commencement of the linea

* The spine of the pubes and the anterior superior spinous process of the os ilium should be committed to memory, as they form points of measurement for taking up the external iliac and superficial femoral arteries.

ileo-pectinea, or brim of the pelvis: into this, part of the conjoined tendon of the internal oblique and transversalis muscles are inserted. Between this ridge of the spine and the acetabulum, there is a depression, g, which gives origin to the pectinalis muscle; and between this surface and the depression, *x*, there is a slight elevated portion of the bone, represented in the drawing by its whiteness or lightness, and which is partly formed by the muscles on each side of it, and partly by the junction of the os pubis with the os ilium, where the pubes forms its proportion of the acetabulum, which is about one-fifth, as is seen in *Fig.* 3, *a*. The body of the bone where the letter h is placed, gives origin to the long head of the triceps, or adductor longus muscle; and nearer the mesial line, and close to the junction or symphysis, k, k, of the two bones of the pubes, and parallel with it, arises the gracilis muscle from the surface, m, m; hence the gracilis, the adductor longus, the pectinalis, and the psoas magnus, and iliacus internus muscles, are nearly on a level, and conceal those more deeply seated. Immediately beneath the letter h, in *Figs.* 1, 2, and 3, Plate III., the pubes is prolonged so as to form what is named its crus, from which arises the adductor brevis; the crus being more distinctly seen in *Fig.* 3, where the junction with the crus of the ischium, through the medium of cartilage, is observed at p; and the point where the adductor brevis is attached, being better illustrated in Plate VIII., *Fig.* 2, q. The inner and lower margin of the crus, which extends from the symphysis to meet the crus ischii, gives attachment to the crus penis in the male, f, f, *Fig.* 2, Plate III., and to the crus clitoridis in the female, f, f, *Fig.* 1, Plate III.; and these bodies are also attached to the crus of the ischium. The crus and body of the os pubis are seen to form part of the large foramen

thyroideum, or obturatorium, U; and at its upper margin, near the acetabulum, there is a groove, u, made by the obturator nerve and artery, emerging from the pelvis, and by the vein re-entering; which groove, however, is indistinctly seen in the Plates. Hernia sometimes occurs at this niche. The large aperture has in the fresh state a ligamentous expanse which shuts it up, excepting only the small hole for these objects; and the ligament, together with the margins of the aperture, gives attachment to two muscles, the obturator externus and internus.

The bones of the pubes are joined to one another at k, k, by cartilage, which union, as it becomes nearly ossified in mature age, is styled symphysis pubis. This junction is sometimes separated by external violence when so great as to induce fatal symptoms. A relaxation sometimes occurs during parturition; and in those subjects where relaxation took place at the sacro-iliac-synchondrosis, there was also relaxation at this junction; which confirms the statements of Vesalius and others. This bone in its structure, fracture, and diseases, resembles the os ilium. Its fetal state I have taken notice of in the description. Its use is to contribute to the formation of the pelvis, by which it assists in protecting and supporting the pelvic and abdominal viscera, together with the urethra and male penis. The urethra, as it passes beneath the symphysis, is supported by a strong ligamentous covering from this part, and the canal here is improperly named membranous; an appellation, which is apt to deceive the young lithotomist.

The os ischium, H, in *Figs.* 1, 2, 3, Plate III., and *Fig.* 2, Plate VIII., is the most dependent or distal bone of the pelvis. The letter H, in *Figs.* 1, 2, and 3, is placed on the body of the ischium, while in *Fig.* 2,

Plate VIII., it is placed on the tuberosity of the bone. The part extending upwards to meet the crus pubis, is styled also the crus or ramus of the ischium, which is best illustrated in *Fig.* 3. From this crus, at its most acute margin, 1, 1, and extending down to the tuberosity, arises the erector penis muscle in the male, as seen in *Fig.* 2, Plates III. and VIII.; and the erector clitoridis muscle in the female, 1, 1, *Fig.* 1, Plate III.; and close at the root of the erector arises the transversus perinei muscle. On the outside of the attachments of the crus penis, or crus clitoridis, the erector penis, and transversus perinei, arises the adductor magnus, or great head of the triceps muscle, from the crus and tuber ischii, 2, 2, 2, *Figs.* 1 and 2, Plate III., and *Fig.* 2, Plate VIII. At 3, 3, *Fig.* 2, Plate VIII., arises the long head of the biceps cruris and semitendinosus muscles conjointly; and from the digit 4, a little nearer the acetabulum and thyroid foramen, arises the semimembranosus muscle, so that the latter is nearly hid by the two former when the subject is on its face: 5, of *Fig.* 2, Plate VIII., indicates the spot where the gemellus inferior originates, and 6 of the same figure, the surface where the long, or outer, or lower sacro-ischiadic ligament is attached: 8, of *Figs.* 1 and 2, Plate III., and *Fig.* 2, Plate VIII., points out the spine of the ischium which gives origin to the superior gemellus muscle, and attachment to the short, or inner, or higher sacro-ischiadic ligament; which two ligaments, extending to the tubercle and oblong flat surface of the sacrum, form two apertures, named sacro-ischiadic, the larger of which is formed by the short ligament attached to the spine of the ischium, 8, and the semicircle or notch of the os ilium, *v*, of *Fig.* 2, Plate VIII. In *Fig.* 2, Plate III., on the right, a dotted line is drawn from the spine, 8, to the tubercle of the os sacrum, which shows the way in which this larger sacro-

ischiadic aperture is formed. Out of this aperture emerge the pyriformis muscle, the great sacro-ischiadic nerve, and the gluteal, ischiadic, and internal pudic arteries; and the accompanying veins of these arteries enter the pelvis. Hernia sometimes occurs here. Through the smaller sacro-ischiadic notch, formed by the two ligaments represented by dotted lines on the opposite side of the same figure, but which is better understood in Plate VIII., *Fig.* 2, there emerges from the pelvis the obturator internus muscle, and there re-enter the internal pudic artery, vein, and nerve: the smooth sinuosity around which the muscle plays being marked 9. A ridge, 7, *Figs.* 1 and 2, Plate III., extends from the acetabulum downwards, between the tuberosity of the ischium and the obturator foramen, which gives origin to the quadratus femoris muscle.

The os ischium, as is observed at *r*, in Plate III., *Fig.* 3, forms the greater portion of the acetabulum, being a little more than two-fifths. The cavity itself is more distinctly seen in Plate VIII., *Fig.* 2, R, where the depth, increased by the brim, is displayed, and which is tipped with cartilage in the recent state. The brim is incomplete at 10, and is filled up in the recent state with a strong cartilaginous ligament, but still an aperture is left beneath it which transmits the nutritious vessels to the joint. The letter R, is placed in the centre of the cavity, which is not tipped with cartilage, like the smooth surface around it, but is placed below the level of the general surface, in order to lodge the mucilaginous gland which lubricates the joint; and at the pubic portion of this rough surface the round ligament of the joint is fixed, which point of attachment should be well understood when amputating at the hip joint. The other end of this ligament is attached to *c*, *Fig.* 3, of Plate VIII., which represents the

circular depression on the smooth head of the os femoris. This joint admits of flexion, extension, abduction, adduction, and rotation, which conjointly form a revolving motion. The brim of the acetabulum is highest at 12, and yet dislocation from a variety of causes most frequently takes place here; and next in frequency, in the opposite direction, downwards and inwards on the obturator foramen: the joint may be luxated in the other directions, but these scarcely ever occur; indeed, from the depth of the acetabulum, and the consequent reception of the prominent head of the os femoris, together with the great strength of the capsular ligament and ligamentum teres, as also from numerous muscles which surround the joint, we should imagine dislocation would never take place.

In the fetus the os ischium is cartilaginous where it forms part of the acetabulum, and where its crus unites with that of the os pubis; which is also the case with its tuberosity and its spine.

The ischium is analogous in its structure to the os ilium and os pubis, and equally so in its fracture and its diseases.

When we compare the two pelves, *Figs.* 1 and 2, we observe a marked difference in the brims, *y*, *y*, or what is named by accoucheurs, the inlets; the female is oval in the lateral direction, while the male is oval in the mesial direction, or from the symphysis pubis to the promontory of the sacrum; and the promontory of the male advances more towards the pubes than in the female. The greatest diameter of both is from the sacro-iliac-synchondrosis to the opposite or diagonal obturator foramen. The venters of the ossa ilium are more concave and capacious in the female, and the sacrum is broader and projects more dorsad; while the coccyx does not advance so far pubic, and is more moveable. The lower aperture of the pelvis,

named the outlet, formed between the symphysis pubis inferiorly, the tuberosities of the ischia, and the tip of the os coccygis, is also larger in the female, in whom we observe a much greater width between the rami of the pubes and ischia than in the male: the narrowness in the latter should be attended to by the lithotomist.

PLATES IV. AND V.

These and the following plate represent the bones of the head, and, as far as possible, the same letters have been applied to the similar points of the similar bones.

The bones of the head, *Fig.* 1, Plate IV., are divided into those of the cranium, and those of the face; Plate V. represents the bones which compose the cranium; and Plate VI. those which compose the face. Those of the cranium, which are delineated in Plate V., are eight in number, and are named the os frontis, *Figs.* 1 and 2; the two ossa parietalia, *Figs.* 3 and 4; the os occipitis, *Figs.* 5 and 6; the two ossa temporum, *Figs.* 7 and 8; the os sphenoides, *Figs.* 9 and 10; and the os ethmoides, *Figs.* 11 and 12. The first six are improperly said to belong to the cranium, and the two last, the sphenoid and ethmoid bones, to be common both to the cranium and face; but the most superficial investigation will at once show the inaccuracy of this arbitrary arrangement, which the frontal bone itself overturns. The bones of the face are delineated in Plate VI., and are fourteen in number; the two ossa nasi are marked 13 and 14; the two ossa maxillaria superiora, 15 and 16; the two ossa lachrymalia, 17 and 18; the two ossa malarum, 19 and 20; the two ossa palati, 21 and 22; the two ossa spongiosa inferiora, 23; the vomer, 24; and the os maxillare inferius, 25 and 26.

The os frontis, *Fig.* 1 of Plate V., and also marked 1 in *Fig.* 1 of Plate IV., is situated in the upper and forepart of the cranium and face, and constitutes a portion of both of these divisions; its shape and appearance are seen in Plate V., where *Fig.* 1 is an external, and *Fig.* 2 an internal view. In the centre of the lower half of the bone, is a small projection *a*, named the nasal process, and on each side of it is another, *b*, *b*, not so distinct, termed the internal angular process; and extending outwards from these in an arched form, are the superciliary ridges, *c*, *c*, on which the eye-brows with their muscles, the corrugator supercilii of each side, are placed; these ridges ending in projections, *d*, *d*, named the external angular processes. Running backwards from these, are two ridges, *e*, *e*, styled the temporal, made by the temporal muscles. Above the internal angular processes and the superciliary ridges, are two elevations, *f*, *f*, made by the frontal sinuses, and above these sinuses are two elevations, *g*, *g*, the centres of ossification in the fetus, which are better understood when compared with *Fig.* 6, Plate IV., where 1, 1, indicate these points in each half of the os frontis. Below the superciliary ridges, are the large concavities *h*, *h*, which contribute to form the sockets for the eyes, and which are more properly depressions than elevations, and better designated as the orbitary plates or depressions than orbitary processes. In each of these depressions there is a smaller one *i*, close to the internal angular process, which lodges the cartilaginous pulley of the superior oblique muscle of the eye; and also another depression, *k*, larger than the preceding, and near the external angular process, which lodges the lachrymal gland. Behind and somewhat below the temporal ridge, *e*, is the temporal depression, *l*, formed by the temporal muscle. Besides these, there are irregular depressions, *m*, *m*, on

the mesial margins of the orbitary plates, which assist to form the ethmoid cells; and above, or coronad to these, are the apertures, *o*, *o*, of the frontal sinuses. On the same margins of the orbitary plates, are two small foramina which are generally formed between this and the ethmoid bone, and are only seen in Plate IV., *Fig.* 1; where, in the line of the transverse suture, within the orbit, near the lachrymal bone, is observed the anterior of the two, named the foramen orbitarium internum anterius, through which passes the nasal twig of the ophthalmic branch of the fifth pair of nerves, accompanied with a branch of the ophthalmic artery. The posterior is situated immediately behind this, or a little deeper in the orbit, and is termed foramen orbitarium internum posterius, and through it passes another branch of the same artery also to the nose. A little deeper in the orbit is seen the round optic foramen of the sphenoid bone, and on the outside of it, a large angular slit, the upper portion of which is formed by the foramen lacerum of the sphenoid bone, and the lower by the spheno-maxillary fissure: these are not joined in the skull, and it is only the perspective view which makes them appear so; but this will be understood after the examination of the other bones of the head. On the superciliary ridges, is a notch or foramen, *n*, *n*, which gives passage to the frontal twig of the ophthalmic branch of the fifth pair of nerves with its artery and vein.

On the internal aspect there are a number of elevations and depressions made by the convolutions of the cerebrum and several foramina, which give transmission to nutritious vessels. There extends across the bone a ridge, *q*, at the commencement of which, near the nasal process, is the foramen cœcum, 6, which towards the coronal aspect becomes a groove, *x*. The foramen, 6, and ridge, *q*, give attachment to the falx cerebri, and the groove, *x*, is formed

by the superior longitudinal sinus,—a point of consideration for the surgeon, but not a preventive to operating.

The os frontis is joined to the ossa parietalia by its circular serrated edge, 2, 18, 2, named the coronal suture; from 2, to the external angular process, *d*, it is joined to the temporal process, *f*, of the sphenoid bone, *Fig.* 9, by part of the sphenoidal suture; and from the external angular process, *d*, by the margin of the orbital plates, *m*, *a*, *b*, *a*, *b*, *a*, *m*, to *d*, the other external angular process, the frontal bone is joined to some of the bones of the face, as the ossa malarum, 19, the os sphenoides, 9, the os ethmoides, 11, the ossa lachrymalia, 17, the ossa maxillaria superiora, 15, and the ossa nasi, 13, of Plate VI., by the transverse suture. The nasal process, *a*, is connected to the nasal lamella, *c*, *c*, of the ethmoid bone, *Fig.* 12. These connections are seen in Plate IV., *Fig.* 1. The os frontis assists to form a portion both of the cranium and face; contributes to support the anterior lobes of the cerebrum, as seen in the horizontal section, *Fig.* 3, Plate IV., *h*, *h*; forms part of the orbit, as seen in *Fig.* 1 of the same plate, as also of the organ of smelling; and, by the frontal sinuses, assists in the reverberation of the voice.

In the fetus, this bone consists of two portions, as represented in *Fig.* 6, Plate IV.; and the superciliary foramina are not formed, and there is no frontal sinus. The two portions contribute to form the anterior fontanelle, *a*. The frontal is one of the thin flat bones, and is lined on each side with a membrane which secretes the bony matter; hence it consists of two tables, and an intermediate spongy substance named the diploe. The outer membrane of this and all the cranial bones, is named pericranium; and the inner membrane is styled dura mater. When the bone is inflamed, the action terminates either in resolution, exfoliation, exostosis, or caries; sometimes a dis-

ease analogous to necrosis affects it; and syphilitic exostosis, or what is termed a venereal node, frequently attacks this bone.

The parietal bone of a quadrangular figure is situated in the upper and lateral part of the cranium, or in the coronal and lateral aspect, as seen in *Fig.* 1, Plate IV. *Figs.* 3 and 4, of Plate V., are representations of this bone, *Fig.* 3 being an external view, and *Fig.* 4 an internal view; consists of four sides and four angles; a superior or coronal side, *a*, *a*; an anterior, *b*, *b*; an inferior or basilar, *c*, *c*; and a posterior or inial side, *d*, *d*: an anterior superior angle *e*: an anterior inferior angle or spinous process, *f*, on the inside of which one of the arteries that supplies the dura mater and bone, makes a deep groove, which in some cases is a foramen; a circumstance to be attended to by the operator in trephining, but not a preventive. The parietal bone has a superior posterior angle, *g*, and a posterior inferior angle, *h*, which has a shallow groove internally, *i*, made by the lateral sinus, another circumstance to be considered in trephining, but not a preventive. Nearly in the middle of the bone, extending from the anterior side almost to the posterior side, in an arched form, is seen the impression, *k*, *k*, made by the temporal muscle; which, however, is better understood in the skull, *Fig.* 1, Plate IV., where the ridge marked *e* commences at the external angular process of the frontal bone: the same letter indicates the ridge in *Fig.* 3, of Plate V. In the centre of the parietal bone is an elevation that forms the commencement of ossification in the fetus, which is better seen at 3, in *Fig.* 6, Plate IV.; and near the superior edge, there is a foramen, *o*, which transmits a vein that terminates in the superior longitudinal sinus.

Fig. 4.—The internal aspect represents the corresponding edges and angles: the groove at *f*, with its ramifica-

tions made by the artery and its branches; and the impression, *i*, made by the lateral sinus at the inferior posterior angle. There are numerous elevations and depressions made by the convolutions of the cerebrum; and when the two parietal bones are joined by their superior edges, a groove, *n*, *n*, is formed by the superior longitudinal sinus; and to the edges of the groove the falx cerebri is attached.

This bone is joined by its superior edge, *a*, *a*, to the opposite parietal bone by the sagittal suture; by its anterior edge, *b*. *b*, to the frontal bone, by the coronal suture; by its anterior inferior angle between *f* and *c*, to the temporal process *f* of the sphenoid bone, *g*, by the part of the sphenoidal suture; by the contiguous arched portion of its inferior edge, from *c* to 4, to part of the squamous portion, *c*, *c*, of the temporal bone, *Fig.* 7, by the squamous suture; by the remainder of its inferior edge, from 4 to 5, to that part of the mamillary portion from *c* to *d*, of the temporal bone, by the additamentum suturæ squamosæ; and by its posterior edge, *d*, *d*, to the occipital bone, *Fig.* 6, from 1 to 2, and 3, by the lambdoidal suture. This bone enters only into the formation of the cranium, and contributes to protect the brain.

In the fetus, none of the sides of this bone are complete, as exemplified in *Fig.* 6, Plate IV., where the two parietal bones, with the frontal, compose the walls of the anterior fontanelle *a*. This space should be attended to by the accoucheur in parturition, and by the operator in puncturing for hydrocephalus. The parietal resembles the os frontis in its structure, and is subject to the same diseases, only syphilitic nodes much more rarely attack this bone.

The occipital bone, *Figs.* 5 and 6, of Plate V., is seen in the basilar views, *Figs.* 2 and 3, of Plate IV., situated in the posterior and basilar aspect of the cranium; and is

of an irregular rhomboidal figure, as exemplified in the external view, *Fig.* 5, and in the internal view, *Fig.* 6. On the external convex aspect, there is a central eminence, *a*, which should be attended to by the operator, as it indicates where the superior longitudinal sinus divides to form the two lateral sinuses; and there extends from this point, on each side, across the bone, a ridge, *b*, *b*, made by the muscles on the back of the head and neck; the occipito-frontalis is attached to its upper margin; the trapezii to its lower margin near the protuberance, *a*, as between *a* and *b*, *b*; and to the protuberance itself, *a*, is attached the ligamentum nuchæ, which is formed by these muscles: also to the lower margin, laterad and basilad to the trapezii, and to the letter *b*, the splenii capitis are attached. A little way below, and parallel to this ridge, is another transverse ridge, *c*, *c*, chiefly made by the complexi muscles, arising from the rough surface between these two ridges, but close to the inferior; the bone being a little depressed between these ridges. Between the lower ridge, *c*, *c*, and the foramen magnum, *k*, the bone is roughened, and slightly depressed, by the recti postici capitis minores in the centre; by the majores a little outward, or laterad and coronad; and by the obliqui superiores, still more laterad and coronad. A perpendicular ridge, *d*, *d*, divides these transverse ridges, so as to form a double crucial one. Basilad to these and to the foramen magnum, *k*, there are two smooth elevations, *i*, *i*, named the condyloid processes, which are articulated to the superior articular processes of the first cervical vertebra by capsular ligaments; and a ridge, *f*, extends outwards or laterad to this, which gives attachment to the lateralis muscle. A long projection, *g*, denominated the cuneiform process, on which, near the condyles, is an irregular transverse ridge, *f*, *f*, made by the recti anteriores minores and recti majores

muscles; the lesser occupy the space between the condyles and this ridge; the greater occupy the space between the ridge and the end of the process, *g*.

The depressions seen on this surface of the bone are merely those between the different ridges made by the muscles, which have been mentioned. At *e*, *e*, however, there is a depression or groove made by the occipital artery,—a matter of consideration for the surgeon, in the event of the vessel being wounded.

The foramina consist of the foramen magnum, *k*, which gives exit to the medulla oblongata of the brain afterwards becoming the spinal marrow, and to the vertebral veins; and affords entrance to the vertebral arteries and the spinal accessory nerves of Willis. Around this foramen, the margin is unequal, to afford attachment to the circular ligament, which by its other end is fixed to the atlas; and between it and each condyle, *i*, there is a rough surface, *n*, to which the lateral ligaments from the processus dentatus of the second vertebra are attached. Between the two condyles at *m*, there is a rough surface on the margin of the foramen, to which the perpendicular ligament from the processus dentatus is fixed. Posterior, or inial to the condyles, are other two foramina, *o*, *o*, more distinctly seen in the internal aspect, *Fig.* 6, which are named the posterior condyloid foramina, and give passage to veins from without to enter the lateral sinuses. Other two foramina are opposed to this, the anterior condyloid, *p*, *p*, which give exit to the ninth or twelfth pair of nerves of the brain, named lingual.

Fig. 6.—The internal view has a crucial ridge somewhat resembling that on the external view; to the upper perpendicular portion, *q*, *q*, is attached a portion of the falx cerebri; to the transverse portion, *r*, *r*, is attached the tentorium cerebelli; and to the lower perpendicular portion,

s, *s*, is fixed the falx cerebelli: the only other projection on this aspect is the cuneiform process, *g*. The depressions are those divided by the ridges; the large ones, *t*, *t*, contribute to support the posterior lobes of the cerebrum, and the equally large ones, *u*, *u*, support the lobes of the cerebellum: *x*, *x*, is the groove or channel made by the termination of the superior longitudinal sinus, which branches into the two lateral that form similar channels, *s*, *s*, and afterwards make the tortuous depressions, *y*, *y*: the course of these sinuses is seen in a connected state in *Figs.* 3 and 4, of Plate IV., as they emerge out of the cranium. The terminations, w, w, of these depressions, along with w, w, of the petrous portions of the temporal bones, contribute to form the large foramina termed the foramina lacera posteriora, which transmit the lateral sinuses, and the glosso-pharyngeal, the nervi vagi, and spinal accessory nerves. On the cuneiform process is a depression, 20, made by the medulla oblongata. The anterior, *p*, *p*, and posterior, *o*, *o*, condyloid foramina, and the foramen magnum, *k*, are also seen in this view.

The os occipitis by the serrated edge, 1, 2, 3, is connected to the posterior edges, *d*, *d*, of both ossa parietalia, *Figs.* 3 and 4, by the lambdoidal suture; by the partially serrated edge from 1 to *g*, to the mamillary and petrous portions, as from *d* to *e*, of the temporal bone, by the additamentum suturæ lambdoidalis; and by the cuneiform process, *g*, to the same process, g, of the sphenoid bone, *Fig.* 10, by part of the sphenoidal suture.

This bone supports the posterior lobes of the cerebrum, and the lobes of the cerebellum, transmits the medulla oblongata, the continuation of these two organs, through the foramen magnum, to become the spinal marrow, and gives entrance to the vertebral arteries, and the accessory nerves, and exit to the same nerves, the nervi vagi, the

glosso-pharyngeal and lingual nerves, and vertebral veins. Between it and the atlas are performed the nodding motions of the head. Dislocation of this from accident has never been known to occur.

The occipital bone in the fetus consists of four parts, as represented in Plate IV., *Fig.* 5.

The diseases to which the occipital bone is subject, are, generally speaking, the same as those of the preceding bones of the cranium.

The ossa temporum, *Figs.* 7 and 8, of Plate V., are situated in the lateral and basilar aspects of the cranium, as exemplified in Plate IV., *Fig.* 1, marked with the digit 7, and in *Fig.* 2, digit 7, also in *Fig.* 3, digit 7. This bone is divided in the description, for simplification, into three portions: a line drawn across from *g* to *c* placed posteriorly, *Fig.* 7, Plate V., indicates the squamous, which is superior; another line from the same *c* to *f*, marks the mamillary or mastoid, which is posterior; and the remainder is the petrous, which is inferior or basilad. On the external aspect of the squamous portion, *Fig.* 7, arises a conspicuous process, *a*, named the zygomatic, which unites with a corresponding process, A, of the os malæ, as seen in *Fig.* 1 of Plate IV., and forms a jugum, under which passes the temporal muscle. At the root of this process, *a*, is an oblong elevation, *b*, upon which the condyloid process, *b*, of the inferior maxillary bone, *Fig.* 26, of Plate VI. moves; and to enable these two convex surfaces to play on each other, there is interposed in the living state an intermediate cartilage, concave on both sides: thus every joint indicates contrivance and wisdom. Nearly the whole of this squamous portion, letters *k*, is depressed by the temporal muscle; and there is the glenoid cavity, *c*, on which the condyloid process of the inferior maxillary bone rests. The inside of this portion is elevated and depressed by the convolu-

tions of the cerebrum, the middle lobes of which it assists to support; and the artery which forms the groove in the spinous process of the parietal bone, makes also a furrow in this, at *j*, *j*, *j*.

The mamillary portion is named after the process, *m*, which is termed mamillary or mastoid, and gives attachment to the sterno-cleido-mastoideus muscle; while the scabrous surface which extends to join the superior ridge, *b*, of the occipital bone, gives attachment to part of the splenius capitis inserted beneath the sterno-cleido-mastoideus: the connection of these surfaces is seen in *Fig.* 2, Plate IV. This process also affords insertion to the trachelo-mastoideus, which lies beneath the splenius capitis. The mastoid process is hollow and arranged into cells, to form part of the organ of hearing, and is an excellent guide to the course of the lateral sinus; so that by this and the protuberance of the occipital bone, we can calculate the course of these sinuses. The deep rut, *b*, gives attachment to the posterior head of the digastric muscle, and the shallow fossa, *n*, basilad to it, which in some skulls is much deeper, is made by the occipital artery. The foramen, 9, gives passage to a vein which enters the lateral sinus. In the internal aspect this foramen is also seen on the margin of the fossa of the lateral sinus, *z*, *y*. On this portion, like the other bones of the cranium, are seen elevations and depressions; but here they are very slight. Along with the large depressions, *s*, *u*, of the occipital bone, it contributes to support the lobes of the cerebellum.

The petrous portion, r, l, *f*, of *Fig.* 7, is of an irregular quadrangular figure, two sides of which are exterior to the cranium, and two interior. On the superior or the glabello-lateral of the two external sides, is, *x*, the auditory ring or process, rough for the attachment of the external cartilage

of the ear; at the base of which is a small projection, *r*, named the vaginal process, which overlaps a long process, *g*, the styloid, arising from the basilar side of these two, and giving attachment to three muscles, the stylo-hyoideus, stylo-pharyngeus, and stylo-glossus, also to two ligaments, the one to the lower jaw-bone, the other to the os hyoides. On the superior side is a considerable depression, E, that assists in the formation of the glenoid cavity, but which only lodges part of the parotid gland; and between this portion and that formed by the squamous, there is a fissure, *g*, named after Glaserus, into which part of the capsular ligament of the joint is inserted, and which transmits the chorda tympani nerve. The letter I points out the large foramen auditorius externus, that transmits the aerial vibrations to the internal ear. In the basilar side, there is an oblong depression, w, which, with the corresponding one, w, of the occipital bone, forms the foramen lacerum posterius; the depression is frequently double, with an intervening ridge, dividing the aperture into two, so that the lateral sinus passes through the posterior, and the nerves through the anterior. Posterior to this depression, at the root of the styloid process, is the foramen stylo-mastoideum, *f*, that gives exit to the facial nerve, and entrance to a small artery to the internal ear; and anterior to the depression, w, is a much larger foramen, *t*, the outer aperture of the carotid canal, the inner of which is also seen at T: this allows the internal carotid artery to enter the cranium, and the great sympathetic nerve to emerge. Nearer the squamous portion than the internal aperture of the carotid canal, and close to *g*, is a double aperture leading to the tympanum of the internal ear, the lower or basilar forming part of the Eustachian trumpet; the upper transmitting a small muscle to the internal ear.

The internal aspect of this petrous portion is easily distinguished, and the anterior side is divided from the posterior by a prominent ridge v, v, named petrosal, to which is attached part of the tentorium cerebelli; and on this ridge there is a small groove made by the superior petrosal sinus or vein, the same letter being applicable: these are more distinctly represented in *Fig.* 3, Plate IV. On the anterior side are several elevations and depressions, partly made by the convolutions of the middle lobe of the cerebrum, and partly by the parts of the internal ear; and near where this surface joins the squamous portion is a small foramen 14, that transmits a twig of the Vidian nerve, which is only seen in *Fig.* 3, Plate IV. On the posterior side are some elevations and depressions, as well as foramina, belonging to the internal ear, which will be considered under that organ; we may notice, however, the large foramen auditorium internum *u*, that transmits the auditory and facial nerves, and a small artery.

The temporal bone is joined by that part of its squamous edge, from *c* to *c*, to the parietal bone, by the squamous suture; from the posterior *c* to *d*, by the additamentum suturæ squamosæ; from *d* to T, to the occipital bone, by the additamentum suturæ lambdoidalis; from T to *g* and *c*, by part of the sphenoidal suture; and by its zygomatic process *a*, to the same process of the cheek bone by the zygomatic suture. The articulation with the inferior maxillary bone will be considered when I come to describe the latter.

In the temporal bone is contained the internal ear, the chief portion of the organ of hearing, which will be described under the organs of sense. The bone also assists to support the middle lobes of the cerebrum, and the lobes of the cerebellum, as well as to give passage to the different nerves and vessels already mentioned. A dis-

case peculiar to this bone, or rather to the membrane lining the mastoid cells, is an abscess which occurs in children, and where the trephine is requisite.

The temporal bone in the fetus has a small fissure between the squamous, and the mamillary and petrous portions; there are no mastoid or styloid processes, and in place of the funnel-like meatus auditorius externus, there is only a smooth bony ring, as exemplified in *Fig.* 6, Plate IV.; the other parts of the internal ear are not yet completed. The mamillary portion contributes to form part of the posterior fontanelle, as represented in *Fig.* 6, Plate IV., letter *b*.

The sphenoid bone is delineated in *Figs.* 9 and 10, Plate V., *Fig.* 9 being an external view. The letters *a* are placed on the central portion, considered the body of the bone, and point out the processus azygos, that is connected to the vomer, and which terminates superiorly in a projection *b*, named the ethmoidal process, on each side of which extends a delicate process, the transverse spinous *c*, *c*, more distinctly seen in *Fig.* 10, the internal view. Anterior to this are the orbitary plates *h*, *h*, and posterior to the latter, and forming the highest points of the bone, are the temporal processes *f*, *f*: extending downwards and backwards from these, are the spinous processes *d*, *d*, from each of which projects a small process *e*, termed styliform; but these may be considered as one process. From the body of the bone there depend four processes, denominated pterygoid: *z*, *z*, point out the external pterygoid, from which arise the external pterygoid muscles: *x*, *x*, the internal pterygoid, at the extremity of which are the two uneiform processes *l*, *l*, around which the tendons of the circumflexi palati muscles play. The two little projections *m*, *m*, are named the triangular processes.

The depressions on the external surface are the orbitary *k*, *k*, at the lower margin of which is a small groove *i*, made by the temporal twig of the superior maxillary branch of the fifth pair of nerves; and behind the orbitary plate, the temporal process is depressed at *k*, *k*, by the temporal muscle; and there is a depression on the external pterygoid process upwards to the root of the temporal and spinous processes, made by the external pterygoid muscle. The foramina are one on each side of the azygos process *a*, marked 9, which may be considered either a depression or foramen; when foramina, they are the apertures of the sphenoidal sinuses. Superior and lateral to these are two, 1, 1, the optic holes that transmit the optic nerves and ophthalmic arteries. On each side of the latter is a long lateral aperture 2, named foramen lacerum anterius, which gives passage to the third, the fourth, the ophthalmic branch of the fifth, and nearly the whole of the sixth pair of nerves to the eye, and also to the ophthalmic vein or sinus. Beneath this there is a round hole 3, the foramen rotundum, that gives exit to the superior maxillary branch of the fifth pair. Posterior to the rotundum is the foramen ovale 4, which transmits the inferior maxillary branch of the fifth pair, and allows a small branch of the ascending pharyngeal artery to enter. Posterior to the ovale is the foramen spinosum 5, through which enters to the cranium the artery that imprints chiefly the temporal and parietal bones. At the root of the internal pterygoid processes, are the foramina Vidiana 8, 8, which transmit the reflected Vidian twigs of the superior maxillary branches of the fifth pair.

On the internal, *Fig.* 10, are observed the body and the different processes, as well as the foramina which are seen externally. The body differs in having four processes,

named clinoid, two of which are anterior, 10, 10, and two posterior, 11, 11; and these with the depression 12, which lodges the pituatary gland, have been termed sella turcica. Posterior to this is another process 9, styled cuneiform. The depressions are the central 12, on each side of which is a fossa 13, made by the internal carotid artery as it passes tortuously into the cranium; and anterior to 12, is a groove 14, made by the decussation of the optic nerves near where they emerge out of the cranium. The transverse spinous processes *c*, *c*, and the ethmoidal *b*, are slightly depressed, where the anterior lobes of the cerebrum rest; and there is a large depression 16, between the temporal *f*, and spinous process *d*, which lodges the middle lobes of the cerebrum; and a large fossa is formed between each of the two pterygoid plates, but chiefly by the internal that lodges the internal pterygoid muscle.

The sphenoid bone is connected by its azygos process to the vomer and nasal lamella of the ethmoid bone by schindylesis; by the ethmoidal process and the body on each side of the azygos process, to the ethmoid bone; the transverse spinous processes, the contiguous edge of the orbitary plate, and part of the temporal process, are connected to the frontal bone; the tip of the temporal process is joined to the spinous process of the parietal bone; the posterior edge of this process onwards to the spinous process, and from the spinous to the cuneiform, is connected to the temporal, and the cuneiform process to the occipital bone; by their anterior surfaces, the pterygoid processes are connected to the palate bones; these processes, again, to the superior maxillary bones; and, lastly, the anterior edges of the orbitary plates to the cheek bones—all by the sphenoidal suture.

The use of this bone has been blended with the description. In the fetal state the bone is tolerably complete, but by a little maceration separates into three pieces, as exemplified in Plate IV., *Fig.* 9; in the body there are no sinuses; the processus azygos is larger than in the adult; and the thin triangular processes are not ossified. The sphenoid bone is subject to no particular disease.

Figs. 11 and 12 represent the ethmoid bone. *Fig.* 11 is the internal view; the letters *a* indicating the cribriform lamella through which pass the filaments of the olfactory nerves, and *b* the crista galli that gives attachment to the commencement of the falx cerebri, which is also connected to the smooth line continuous with the crista galli. Descending perpendicularly into the nose from the crista galli, is the nasal lamella or septum *c*, *c*, seen in *Fig.* 12; and on each side of this is the turbinated or spongy portion, letters *d*, on which the olfactory nerves are chiefly distributed: the plain surfaces *e*, *e*, denominated ossa plana, enter into the formation of the orbit; and *f*, *f*, *f*, are the ethmoidal sinuses or cells. By the crista galli and cribriform lamella, the ethmoid is joined to the frontal bone; by its posterior surface and the same lamella, to the sphenoid bone; by its nasal lamella, to the sphenoid, vomer, and nasal process of the frontal and nasal bones; and by its plain surface, to the frontal, the lacrymal, the superior maxillary, and the palate bones,—all of which, generally speaking, are considered the ethmoidal suture.

Excepting the crista galli, and nasal lamella, which are cartilaginous, this bone, in the fetus, is ossified and complete.

The ethmoid bone is frequently attacked in secondary syphilis and noli me tangere, and soon ulcerates; and the nasal lamella is sometimes so twisted to one side, that the convex surface has been mistaken for a polypus.

The bones of the cranium, which have now been described, form that large cavity, a horizontal section of which is seen in Plate IV., *Fig.* 3, and a perpendicular one, *Fig.* 4. In this cavity is contained the cerebrum and cerebellum, with their continuation, the medulla oblongata, and the different nerves centring in them; also the blood-vessels supplying them, and the membranes enveloping them. The crista galli *b*, the foramen cœcum 6, the ridge of the frontal bone *q*, the delicate ridge of the parietal bone *n*, *n*, and that of the occipital bone *q*, all afford attachment to the falx cerebri, which divides the cerebrum into two hemispheres. On *h*, *h*, of the frontal bone, and *c*, *c*, of the sphenoid bone, rest the two anterior lobes of the hemispheres; on 16, 16, of the sphenoid bone, and 7, 7, of the temporal bones, rest the two middle lobes of the cerebrum; on *t*, *t*, of the occipital bone, rest the two posterior lobes, which are also supported by the tentorium attached to the petrosal ridges, letters v, of the temporal bones, and to the ridges, letters *r*, of the occipital bone. A very small portion of the parietal at *i*, also affords attachment to this membrane; while *u*, *u*, of the occipital bone support the two lobes of the cerebellum, which are separated by the falx cerebelli attached to the ridge *s*, of the occipital bone. In the osseous state, therefore, the two petrosal ridges, and the transverse ridge of the occipital bone, form the bounds of separation between the cerebellum and cerebrum; the petrosal ridges also separate the posterior from the middle lobes of the cerebrum; while the transverse spinous processes of the sphenoid bone separate the middle from the anterior lobes of the cerebrum. In the living state, these partitions are assisted by productions of the dura mater attached to these ridges. On the depression 20, of the occipital bone, rests the medulla oblongata.

In these figures, the processes and foramina in the cranium, are marked with the same figures and letters as in the individual bones, so that they do not require to be pointed out or described.

The bones of the cranium constitute a class named the flat bones, dense and compact, and consisting of two tables, the exterior of which is the thicker, the interior the more dense and denominated vitrea; and between these is an intermediate spongy substance, termed diploe. From this structure, and from their presenting a convex or globular surface, the line of fracture runs along, occasionally in various directions, similar to a globe of glass when broken; sometimes only the external table is fractured, while the internal remains sound; at other times, the reverse takes place, and not unfrequently with depression: again, the side of the cranium opposite to the spot where the injury has been inflicted, is occasionally fractured. When inflammation attacks these bones, the disease terminates either in resolution, exfoliation, caries, or exostosis. If the external table is deprived of vitality, they generally exfoliate or throw off a scale, which is regenerated by the vessels of the dura mater, and internal table, as well as by those of the pericranium; and when both tables are divested of life, a separation takes place between the dead and the living bone; the dead portion is forced outwards, or requires removal, and the part is regenerated by the vessels of the pericranium, of the dura mater, and those of the contiguous living bone. If the portion of the cranium is very large, such injury is done to the pericranium and dura mater, that the bone is not regenerated; * and

* Consult "Observations Chirurgicales," by Saviard, and Gooch's Chirurgical Works.

the same result sometimes takes place, even when no injury or constitutional affection can be traced: in this case, I should imagine the vessels are obliterated by too great a deposition of phosphate of lime; the bone consequently dies, becomes a neutral object, excites irritation, and causes a separation.* From their configuration, and not from their structure, the bones of the cranium never end in necrosis, if we consider the term expressive of the death of the old bone with the generation of a new one exterior to it, which is the general acceptation by the profession, although, etymologically, it means merely the destruction of the old bone. Exostosis, as mentioned under the frontal bone, frequently attacks the exterior surface of the cranium, but this tumour sometimes grows from the diploe, making its way through the inner table, and injuring the brain; at other times it grows from the inner table only, and produces either apoplexy, epilepsy, or palsy, which sooner or later proves fatal.

In comparing the fetal cranium with that of the adult, it will be observed that the bones are apart from each other, and no indentations formed, and that there are also three conspicuous deficiencies of bony matter, as at *a* and *b*, *Fig.* 6, Plate IV. The bones not having united to form sutures before birth, allow the head to be modelled to the passages during parturition; the large anterior fontanelle *a*, enabling the accoucheur to ascertain whether the child be alive or not. The shape and nature of the fontanelle should be considered by the operator when removing the water in the ventricles of the brain in hydrocephalus.

* This peculiar disease is clearly described in the Edinburgh Medico-chirurgical Transactions, vol. 1, by Mr. Russel, Professor of Clinical Surgery.

PLATE VI.

Is a representation of the individual bones of the face. *Figs.* 13 and 14 are drawings of the bones of the nose; *Fig.* 13 is the external, and 14 the internal view. Their situation in the face is seen in *Fig.* 1 of Plate IV., where they form the arch of the nose; they are of an oblong figure, slightly convex externally, as seen in *Fig.* 13, and gently concave internally, as seen in *Fig.* 14. Their superior edge, which may be termed an extremity b, is thick and rough where it is articulated by the transverse suture to the frontal bone. Each of the long sides, H and N, is alternately depressed a little, that they may form a secure arch with each other, and with the superior maxillary bones on which they rest. The lower or distal extremity is thin and irregular by which it is joined to the lateral cartilages of the nose. Nearly in the centre of the bone is a foramen, which transmits a small vein. The side H, is joined to the opposite bone by the anterior nasal suture; the side N, rests on the anterior margin of the nasal process B, of the superior maxillary bone, *Fig.* 15, and forms the lateral nasal suture; and internally, where they form the anterior nasal suture, they rest on part of the septum narium, or nasal lamella of the ethmoid bone, and centre cartilage of the nostrils, forming the arch of the nose, and also defending its root. These bones are almost complete in the fetus, but are shorter and not so thick at their superior or glabellar extremity. In their structure they are firm and solid, and when fractured, the direction is either transverse or varied, according to circumstances; and they are subject to no peculiar disease, except that they are sometimes involved in the inveterate ulceration of the face, named noli me tangere.

Figs. 15 and 16 are delineations of the superior maxillary bone; *Fig.* 15 is the external, and *Fig.* 16 the internal view. The situation of this bone is seen in Plate IV., *Fig.* 1. Its most elevated process B, enters into the formation of the cavity of the nares, and is named the nasal process; extending downwards and outwards from this is a smooth plate H, styled the orbitary process; and on the exterior of this is a rough projection, *l*, termed the malar process, the lower anterior margin of which gives origin to part of the masseter muscle. On the nasal process, and exterior to the edge of the orbitar and malar processes, is a delicate ridge, more distinctly seen in the skull, *Fig.* 1, of Plate IV., to which is attached the elevator labii superioris alæque nasi. Behind the malar process, the bone terminates in a round prominent manner, named the bulbous process, *g*, from the rough upper portion of which, part of the pterygoideus externus muscle derives its origin. Where the bone receives the teeth, there are numerous slight projections, letters *n*, styled the alveolar processes; proceeding inwards from these, the bone is rough and arched, V, to form the roof of the mouth, which is denominated its palatine process, and gives attachment to the palate, forming also the floor of the nostrils; and from this plate arises a rough edge, *d*, *d*, which, when joined with the opposite bone, forms part of the septum narium, and is named its spinous process. Above this last, on the nasal and bulbous processes, is a delicate ridge, *e*, *e*, that supports the inferior spongy bone, *Fig.* 23; this is well exemplified in *Fig.* 27, in which it is observable, that the palate bone, *Fig.* 21, covers the posterior portion of the ridge, so that the inferior spongy bone is supported by the ridge on the nasal process of the superior maxillary bone, and the ridge, E, E, on the palate bone.

On this bone there are several depressions; one in particular, marked D, on the nasal process, B, where it looks to the orbitary process, and which becomes a conspicuous fossa towards the nostrils; this, with the lacrymal bone, *Fig.* 17, and the inferior spongy bone, *Fig.* 23, forms a tube named the lacrymal or nasal duct, that transmits the tears from the eye to the nose; and in *Fig.* 27, the junction of this bone to the inferior spongy bone is seen, and in *Fig.* 28, the junction to the lacrymal bone. This fossa being subject to disease, should be attended to by the operator, and the portion which the superior maxillary bone forms, is too dense to be pierced. The ligament of the tarsi is fixed to the nasal process at *t*, nearly at the commencement of the fossa, and is in danger of being injured in the operation of puncturing the lacrymal bone: the inferior oblique muscle of the eye arises within the margin of the orbitary process at *r*, not from the nasal, and is secure from danger. Below the infra-orbitary foramen, *o*, is a depression, *p*, from which the levator anguli oris arises, and beneath the anterior aperture of the nares, a depression, *q*, that gives origin to the depressor labii superioris. Behind the malar process, the bone is depressed by the temporal muscle which is seen more satisfactorily in the connected skull, *Fig.* 1, of Plate IV. The orbitar plate is depressed or concave, so as to form part of the sphere of the orbit; and at its posterior point there is a depression, C, on which rests the orbitary process, *a*, of the os palati, *Fig.* 21; the junction being well exemplified in *Fig.* 27. On the bulbous process, *g*, are two rough depressions, *x*, *z*, where the pterygoid portion, *x*, *y*, *z*, of the palate bone, *Fig.* 22, joins; and immediately above, there is a fossa, *s*, turning obliquely downwards, which, together with the fossa, *s*, of the palate bone forms the palato-maxillary canal, that

transmits the palatine twig of the superior maxillary branch of the fifth pair of nerves. The numerous sockets of the teeth are styled alveolar depressions. The concavity of the palatine plate v, where it forms the roof of the mouth, is also concave, and forms the floor of the nostrils. The large cavity A, that occupies the whole interior of the bone so as to render the walls rather thin, is named the antrum maxillare; and in the fresh subject is lined with a vascular periosteum, leaving merely a small aperture communicating with the nostrils between the superior, *d*, and inferior, 23, spongy bones, as seen in *Fig.* 4, Plate IV., which is a vertical section of the skull.

The foramina are the infra-orbitary, *o*, and incisive, *b*. The infra-orbitary is a canal open posteriorly on the orbitary plate at *o*, where the nerve, which has the same name, and is a twig of the superior maxillary branch of the fifth pair of nerves, enters. The incisive hole, *b*, is also a canal, transmits one or two nasal twigs of the same branch from the nostrils to the palate, and has one aperture towards the palate common to both superior maxillary bones, and two towards the nostrils, one proper to each bone.

The superior maxillary bone is joined at the tip of its nasal process to the os frontis by part of the transverse suture; by the anterior edge of this process to the edge of the os nasi by the lateral nasal suture; by the posterior edge of this process to the os lacrymale by the lacrymal suture; by the mesial edge of its orbitary plate to the lacrymal bone, the plain portion of the os ethmoides, and the orbitary process of the palate bone by the lacrymal, the ethmoidal, and the palato-maxillary sutures; and by its malar process to the os malæ by the internal and external orbitary sutures. The alveolar sockets receive the teeth by gomphosis. The superior maxillary bone is joined to

that of the opposite side by the spinous ridges, to form the greater portion of the longitudinal palatine suture, which ridges, when joined, receive the vomer, *Fig.* 24; the external portion of their union, extending from the external aperture of the nares, between the central incisive teeth, is named the mystachial suture, seen in Plate IV., *Fig.* 1. By the posterior margin of the palatine plate, the bone is joined to the palatine plate *n*, of the os palati, *Fig.* 22, by the transverse palatine suture; and by the depressions *x*, and *z*, to the pterygoid portion similarly marked, of the palate bone, and to the nasal lamella A, of the same bone, by part of the palato-maxillary suture. Lastly, the ridge *e*, with a similar ridge E, of the palate bone, *Fig.* 21, gives support to the inferior spongy bone, *Fig.* 23, which is well exemplified in *Fig.* 27.

The uses of this bone have been mentioned in the description, and need not be repeated. The structure is rendered so thin by the antrum, that it easily becomes carious, and this state always accompanies the tumours which occur in this cavity; a disease of the most fatal nature. All the cases which I have witnessed of this malady, whether operated on or not, have proved fatal.* The antrum is subject to abscess, the matter of which must be evacuated by extracting the second molar tooth and perforating the bone. The anterior part of the bone is sometimes involved in noli me tangere, and the alveolar processes are frequently attacked with caries in the diseases of the teeth, and the different affections of the gums, or where too much mercury has been exhibited in the

* John Bell's Principles of Surgery, Vol. III., contain some very valuable remarks on this disease. There is only one instance in which an operation has proved successful that I am acquainted with: the patient, a woman, had a tumour removed from the antrum, three years ago, in the Infirmary, by Mr. Newbigging, and is still living.

treatment of syphilis or other diseases; and the palatine plate is sometimes involved in the syphilitic ulceration of the soft palate. In the fetus, instead of the large antrum, there is only an oblong depression at the side of the nostrils; the malar process is hollow, with several holes in it; the alveolar sockets are fewer in number; and the palate plate is cribriform in the centre.

Figs. 17 and 18 are representations of the lacrymal bone, situated at the inner angle of the orbit, as seen in *Fig.* 1, Plate IV. The external view is delineated in *Fig.* 17, and is distinguished by having two depressions G, F, separated by a perpendicular ridge E, E; the depression G, is the anterior and narrower of the two, and along with the groove D, of the superior maxillary bone, *Fig.* 16, and the inferior spongy bone, *Fig.* 23, forms the lacrymal duct, in the upper portion of which the lachrymal sac is supported: the depression F, forms part of the orbit. *Fig.* 18 is the internal view, and has two irregular convex surfaces with a groove running between them. This bone is joined superiorly to the frontal bone by part of the transverse suture; anteriorly to the nasal process at D, of the superior maxillary bone; inferiorly, to the orbitary process of the same bone; and posteriorly, or internally, in the orbit, to the plain surface *e*, of the ethmoid bone, *Fig.* 11, Plate V., by the lacrymal suture. Besides the uses already mentioned, this bone forms part of the nostrils, and shuts up some of the ethmoidal cells. The anterior depression G, should be studied by the surgeon in fistula lacrymalis, whether in regard to palliative treatment, or for the purpose of operation. This bone is so extremely thin, being generally cribriform in the anterior portion, that it readily ulcerates either in affections of the eye or nose. The lacrymal bone is fully formed in the fetus.

The os malæ, or cheek-bone, is of a quadrangular

figure, as seen in *Fig.* 19, and forms the prominent part of the cheek, as seen in *Fig.* 1, Plate IV. This is the cheek-bone of the right side; the superior angle D, is termed the superior orbitar process; the anterior angle L, is named the inferior orbitar process; the inferior angle K, is denominated the maxillary process; and the posterior angle A, is styled the zygomatic process. Between the two orbitary processes D, L, the bone extends into the orbit in a concave form *b*, as seen in the internal view, *Fig.* 20: this is sometimes named the internal orbitar process; but is more properly a depression than a process. Posterior and inferior to this, is another large depression *k*, made by the temporal muscle. From the lower edge, between A and K, arise part of the masseter muscle, and the whole of the zygomaticus major; and sometimes from near the middle of the bone arise the zygomaticus minor, and part of the levator labii superioris alæque nasi. Nearly in the centre of the bone externally, is one or more holes which transmit small nerves and blood-vessels to and from the orbit; and on the internal surface are similar holes. The cheek-bone is joined by the superior orbitar process D, to the external angular process *d*, of the frontal bone, by part of the transverse suture; by the upper half of the internal orbitar process *b*, to the orbitar plate *h*, of the sphenoid bone, by part of the sphenoidal suture, and by the lower half of the internal orbitar process *b*, to the orbitar process H, of the superior maxillary bone, by the internal orbitar suture; by the margin of the bone from the inferior orbitar process L to the maxillary process K, to the malar process *l* of the superior maxillary bone, by the external orbitar suture; and lastly, by the zygomatic process A, to the zygomatic process *a*, of the temporal bone, by the zygomatic suture. The centre of the margin of the internal orbitar process, where the bone is neither

connected to the sphenoid nor superior maxillary bones, contributes to form the spheno-maxillary aperture, which is seen in Plate IV., *Fig.* 2, letter R.

The cheek-bone has a dense structure, and resembles the bones of the cranium, with the exception of some cancelli at the maxillary process; is subject to no particular disease, except being sometimes involved in noli me tangere; and any of its processes, particularly the zygomatic, might be fractured, in which case the direction would be oblique. In the fetus, this bone is completely ossified.

The os palati is depicted in *Figs.* 21 and 22; the view which looks to the nostrils is represented in 21, and that which looks posteriorly and outwardly in 22. Its situation in the skull is seen in Plate IV., *Fig.* 2, but more distinctly in this plate, *Fig.* 27. The palate bone is generally divided into portions to simplify the description: *n* indicates the palatine, whence the bone has derived its name; P, P, the nasal lamella; *x*, *y*, *z*, the pterygoid portion; and *a*, the orbitar portion. The palatine *n*, is a square plate which resembles that, v, of the superior maxillary bone: its posterior edge, acutely arched, supports the velum pendulum palati, and projects backwards to join the palatine plate of the opposite bone to give origin to the azygos uvulæ muscle; its anterior edge is a little rugged to form a firm junction with the same plate v, of the superior maxillary bone, which is exemplified in *Fig.* 27, where the two bones are represented a little apart. The mesial or inner edge d, named the spine, precisely resembles the same part *d*, of the superior maxillary bone. The nasal lamella P, P, is extremely thin, rises up from the palatine portion, having a ridge E, E, which assists to support the inferior spongy bone, as represented in *Fig.* 27; and this ridge makes two concave surfaces F, P, that enlarge the nares: the lamella itself contributing to shut

up the antrum. The pterygoid portion is the inferior posterior part; has three depressions *x*, *y*, *z*: *x* and *z* are formed by the pterygoid processes of the sphenoid bone, and *y* contributes to form the fossa between them. The orbitar portion *a*, consists of the proper orbitar process on which the letter *a* is placed, and the posterior projection *b*, also named orbitar process; the one the anterior, the other the posterior. The open aperture *o*, that separates these two processes, is sometimes a complete foramen; but as the sphenoid bone generally enters into its formation, it may be denominated the spheno-palatine foramen: through which twigs of the superior maxillary branch of the fifth pair of nerves, accompanied by a branch of the internal maxillary artery, pass to the nose; and generally one or two veins return. The anterior or proper orbitar process has a cell which joins those of the ethmoid bone. A groove *s*, extends downwards on the external surface of the nasal lamella to the pterygoid and palatine portions, and becomes an entire canal when the bone is joined to the superior maxillary bone; hence named the palato-maxillary canal, and transmits the palatine twig of the superior maxillary nerve. In this canal a small foramen, which gives passage to a nasal twig of the nerve, is generally seen through the nasal lamella.

The palate bone is joined by the spinous ridge, *d*, to the same part of its fellow, so as to complete the longitudinal palatine suture, as seen in *Fig.* 2, Plate IV.: the nasal ridge formed by this union giving rest to part of the vomer. The bone is joined by the anterior edge, *n*, of the palatine plate, to the corresponding plate of the superior maxillary bone, by the transverse palatine suture, as seen in *Fig.* 27 of this plate, and *Fig.* 2, Plate IV.; posteriorly by its pterygoid portion, *x*, *z*, and by the edge of the nasal lamella, *p*, to the pterygoid processes of the sphenoid

bone; by the orbitar portion, *a*, to the same bone, by the spheno-palatine suture; by the anterior and outer aspect of the pterygoid portion, along with the nasal lamella and orbitar process, to the bulbous and orbitary processes of the superior maxillary bone, by the palato-maxillary suture; also, by the mesial aspect of the orbitar process, to the plain surface of the ethmoid bone, by part of the transverse suture. The ridge, E, E, on the nasal lamella gives support to the inferior spongy bone, as seen in *Fig. 27.*

From the description, it will appear, that the palate bone forms part of the roof of the mouth, the floor and side of the nostrils, the floor of the orbit, and part of the walls of the antrum, and of the ethmoid and sphenoid cells, as seen in *Fig.* 27 of this plate, and in *Fig.* 4, Plate IV.

Excepting the cells which are not formed, the palate bone, in the fetus, is complete: the nasal lamella is even thicker than in the adult. This bone is liable to be involved in diseases of the antrum, nostrils, and palate.

Fig. 23 is the view of the os spongiosum inferius, that looks to the antrum maxillare, and is a delicate cribriform bone, like the turbinated portions of the ethmoid with which it is contrasted; rests on the nasal ridges of the superior maxillary and palate bones; and contributes to form the nasal duct, and the walls of the antrum. On this bone the extremes of some of the nasal twigs of the superior maxillary nerve are distributed, which assist in the formation of the organ of smelling. Its connexions are represented in *Fig.* 27; and the bone is almost complete in the fetus. From its delicate structure, the inferior spongy bone is easily rendered carious, and is very liable to be attacked in the secondary symptoms of syphilis.

Fig. 24 is the vomer, of an irregular rhomboidal figure, situated in the posterior part of the nostrils, and forming the chief portion of the partition, as seen in *Fig.* 2, Plate IV. The superior edge, *a*, has a deep furrow, which sometimes nearly separates the bone into two laminæ; this receives the azygos process of the sphenoid bone: the anterior edge, *c*, has also a groove for the reception of the nasal lamella of the ethmoid bone, and the cartilaginous septum of the nostrils: the inferior edge, *d*, rests between the nasal spines of the superior maxillary and palate bones: the short edge, *b*, may be considered a continuation of the anterior, for it is grooved, and receives the cartilaginous septum. These junctions of the vomer are named schindylesis. Besides the use already mentioned, the vomer contributes to enlarge the organ of smelling, by affording a greater surface for the expansion of the nerves of that sense.

This bone is frequently so much twisted to one side, as to resemble a tumour, and be mistaken for a polypus; and is so delicate in its structure, that it soon yields when attacked with syphilitic ulceration, and is equally easily destroyed in noli me tangere and tumours of the nostrils.

The structure of the nostrils is of importance to know, on account of the diseases to which they are liable, independently of the interest of the organ in a physiological view. In *Fig.* 1 of Plate IV., is seen the external aperture formed by the nasal bones, 13, and the superior maxillary bones, 15, and immediately within this opening, the vomer, 24, commencing the septum, which divides the nares into two cavities; and, on the right side, the inferior spongy bone, 23. In *Fig.* 2 of the same Plate, is seen the internal or posterior opening formed by the palate bones, 21, 22, and the internal pterygoid processes,

x, *x*, of the sphenoid bone; and the vomer, 24, in the centre, with the inferior spongy bone in each nostril, is also seen in this view. *Fig.* 4 of the same Plate illustrates a section of the nostrils, the vomer being removed: 18 indicates the os nasi; B, the nasal process, and *d*, d, the palatine processes of the superior maxillary and palate bones; the letter *c* points out the nasal lamella of the ethmoid bone, which forms the upper portion of the septum; *d*, the turbinated portion of the same bone or the superior spongy bone; 23, the inferior spongy bone; and *x*, the internal pterygoid process of the sphenoid bone. From these views of the nostrils, we observe, that in hemorrhage, or epistaxis, and in polypi, there is but a narrow passage close to the floor, or palatine plates, and to the vomer, in each nostril, through which we may introduce probes and ligatures into the throat. In polypi, which hang from the upper spongy bone, *d*, there is considerable difficulty in reaching them. When the polypi are large and firm, we can easily conceive how rapidly they will destroy these cribriform bones and delicate cells; as well as how tumours in the antrum will destroy these delicate bones. The cells which communicate with the nostrils, are the frontal sinuses, *f*, the ethmoid cells also marked, *f*, the cells of the palate bone, and the sphenoid cells, 9, with the maxillary antrum, which has an opening between the spongy bones, *d*, and 23, but scarcely seen in this view: it is however well illustrated in *Fig.* 27 of Plate VI. The ethmoid cells are also well exemplified in *Fig.* 29 of the same Plate, and are marked *f*, *f*. All these cavities are designed to reverberate the voice, but not to assist in the formation of the organ of smelling. Among many of the other mammiferous animals, these cells extend over the greater portion of the cranium, as in the

sow and the elephant. In the ox, the frontal sinuses communicate with the cellular structure of the horns.

Figs. 25 and 26 are representations of the inferior maxillary bone; the former is an external, the latter an internal view. From the one mental foramen, *f*, to the hole on the other side of the bone, is named the body; from this foramen, *f*, to the angle, *d*, is termed the side; and from the angle, *d*, upwards to the two processes, *b*, and *k*, is styled the ramus; the bone resting on the base, *a*, *a*. In the centre of the body is a ridge, *c*, cartilaginous in the fetus, and named the symphysis menti; and on each side of this, are two rough surfaces, the lower being the more elevated; the upper, *h*, gives attachment to the levator labii inferioris, and between this pair of muscles and a little above, the frænum of the lip is attached; the lower, *i*, gives origin to the depressor labii inferioris, which arises from the base onwards to the contiguous, *a*. Between the letters *a*, the bone is roughened on the base and side, where the depressor anguli oris arises; and the angle, *d*, is also rough, as well as the ramus some way upwards, where the masseter muscle is inserted. The letter *b*, marks the smooth condyle which moves on *b*, of the temporal bone, through the medium of a doubly concave cartilage; and the root of this where the bone is narrower, is named the cervix, *e*, to which is attached the capsular ligament. The projection, *k*, is styled the coronoid process, which is rough for some way downwards, to give insertion to the temporal muscle; and the ridge, *g*, which extends forwards from the root of this, gives attachment to part of the buccinator muscle. The upper margin of the bone has alveolar processes, M, and sockets for the teeth. There is only one foramen, *f*, the mental, which gives exit to the osseous branch of the in-

ferior maxillary nerve, with a small artery and vein; the nerve sometimes requires to be divided in consequence of neuralgia; and the foramen can be most accurately ascertained by drawing a perpendicular line from the second molar tooth to the base of the bone.

On the internal aspect, *Fig.* 26, in the centre, is the symphysis, with two little elevations, and a ridge towards the base; the two elevations, *n*, *n*, affording origin to the genio-hyo-glossi muscles; the frænum linguæ is attached immediately above them; and the genio-hyoidei muscles arise below them from the ridge; and beneath these last, from the little rough surfaces, *m*, *m*, arise the anterior heads of the digastric muscles. The ridges, *p*, *p*, afford origin to the mylo-hyoidei muscles; the rough surface, *q*, on the inside of the angle, *d*, gives insertion to the pterygoideus internus muscle, and the angle gives attachment to the lateral ligament, which extends to the styloid process of the temporal bone; while the rough surface, *o*, at the root and neck of the condyle, affords attachment to the external pterygoid muscle. The aperture, *r*, gives entrance to the osseous branch of the inferior maxillary nerve, along with a branch of the internal maxillary artery and vein. This nerve becomes sometimes the subject of operation. Extending from this aperture is a groove, *s*, made by a twig of this nerve.

The lower jaw-bone is articulated to the temporal bone, by a strong capsular ligament; and as two convex surfaces move on each other, through the medium of a doubly concave cartilage, motion takes place downwards and upwards, and from side to side, and is, in some degree, rotatory. When motion downwards is performed to too great an extent, the condyloid process slips forwards beyond the elevation, *b*, of the temporal bone; and dislocation, which happens most frequently in children whose

articulation is shallower, occurs only in this direction. The lower jaw-bone receives the teeth by gomphosis. In the fetus, the inferior maxillary bone consists of two pieces connected to each other, at the symphysis by cartilage, and there are much fewer alveolar processes, sockets, and teeth.

This bone is very dense in its structure, and is one of those most subject to necrosis, affording one of the best illustrations of the modus operandi in this disease.* Its alveolar processes are spongy, like those of the upper jaw-bone, and are nearly equally subject to caries consequent on diseases of the teeth and gums.

The teeth, sixteen in number, in each maxilla of the adult, are divided into the four anterior, named incisive, the one on each side of these, termed the canine, or cuspidatus, and the five posterior to each of the last, denominated the molar. The five molares of each side are subdivided into the bicuspides, which are the two anterior, and into the proper molares, which are the three posterior; the last of which is named, dens sapientiæ. Each tooth consists of a crown, the smooth enamelled portion which is above the gums in the living state, a cervix where the tooth is a little smaller in circumference, and to which the gum is attached, and the root or fang which is lodged in the alveolar socket. At the tip of each fang is a very small hole, that leads up to a cavity in the crown of the tooth: the small twigs of the nerves and blood-vessels enter the foramina, and form a beautiful tissue in this cavity, which is also lined with a sensitive vascular membrane.

The incisive differ from the others, in having their crowns formed of an anterior convex surface, and a posterior or inner concave surface, which meet superiorly,

* See Cases detailed by Guernery, Baier, Bousselin, Walker (of America,) and Russel.

and form a horizontally-cutting edge with two apices:—they have only one fang or root.

The canine or cuspidati have their crowns terminating in one point, and have only one fang.

The bicuspides have their crowns tipped with two points, and have one fang like the two preceding divisions, with this difference, that the fang is flatter, and appears like two united into one. The proper molares have their crowns of a square form, with rounded angles, and are studded generally with five points; the molares of the upper jaw have usually three fangs, while those of the lower have only two; and the last of these, or dens sapientiæ, is smaller than the other two, and has its fangs generally united into one.

The diseases to which the teeth are liable, can be said to be only denudation or desquamation, decay or rottenness, and fractures; for, the other diseases which are generally considered as belonging to them, attack the contiguous substances, and then only sometimes involve them. Thus, odontalgia, or toothach, is an inflammation of the delicate membrane and vessels in the cavity of the tooth. The caries which is said to attack them, is simply decay, not ulceration. The tartar which accumulates on them, is an external deposition of substance. Caries, exostosis, and abscesses, of the alveolar processes, necrosis of the inferior maxilla, gum biles, tumours of the gums, abscess of the antrum maxillare, and neuralgia of either the superior or inferior maxillary nerves, are sometimes sequences of diseased teeth. As the teeth are extremely hard and dense, the fracture is perpendicular, or oblique and splintery.

The condition of the teeth in the fetus, and their formation, will be considered after the description of all the bones.

Besides the bones of the head which have been described, there are in some skulls small portions of bone in the course of the lambdoidal suture, which are named ossa triquetra, or Wormiana, though they are properly parts, either of the occipital, or parietal bone. These are more observable in young crania, before the bones are completely formed, than in adult skulls. They are sometimes met with in other sutures besides the lambdoidal.

PLATE VII.

Represents the bones of the upper extremity, excepting the clavicle, which is seen in Plate I., marked with the letter *c*, nearest the head, and in Plate II., *Fig.* 1, *p*; this bone, with the scapula, *k*, of the same Plate and figure, or *Figs.* 1 or 2, of this Plate VII., constitutes the bones of the shoulder. *Figs.* 3 or 4, is the bone of the arm; *Figs.* 5 or 6, refers to the bones of the fore-arm; and *Figs.* 7 or 8, to the bones of the hand, which are subdivided into those of the carpus, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, those of the metacarpus, 1, 2, 3, 4, 5, and those of the phalanges, 6, 7, 8, 9, 10; 11, 12, 13, 14; and 15, 16, 17, 18, 19.

The bones of the shoulder are two in number, the clavicle and scapula. The clavicle, *p*, *Fig.* 1, Plate II., resembling an italic *f* in figure, is situated at the upper and lateral part of the thorax, and forms the connecting link between the bones of the trunk and those of the upper extremity. Its superior posterior, or its atlantal and dorsal margin, gives attachment to the sterno-cleido-mastoideus and trapezius muscles; the latter occupying the scapulary third, 1, 1, and the former a little more than the sternal third, 2, 2, leaving the space between them without any muscles. To the sternal and somewhat sacral margin, are

attached the pectoralis major and deltoid muscles; the former occupying nearly the two sternal thirds, 3, 3, 3, and the latter a little more than the scapulary third, 4, 4. The inferior or sacral surface affords insertion to the subclavius muscle, and attachment to the rhomboid ligament, near which the chief medullary vessels enter the bone.

The clavicle is articulated by its sternal end, which is triangular, to the first or upper portion of the sternum, by a capsular ligament; and within the joint is interposed an interarticular cartilage. A strong ligament, named interclavicular, extends from the dorsal aspect of this end, which is formed into a sharp ridge, to such another ridge in the opposite clavicle. A strong ligament, termed rhomboid, extends between the bone and the cartilage of the first rib. As the clavicle passes over the coracoid process 5, of the scapula *k*, there is a tubercle and roughened surface on its sacral aspect, which give attachment to the conoid and trapezoid ligaments, extending from the root of the coracoid process; and it is articulated by its scapulary extremity, which is flattened horizontally, and of an oblong shape, to the acromion process 6, of the scapula, by capsular and transverse ligaments. From these strong attachments, the clavicle is seldom dislocated at either of its extremities, being much oftener fractured, an accident which frequently happens to this bone. The articulation at the sternal end allows the clavicle to be moved forwards, backwards, upwards, and downwards. The clavicle forms a lever on which the other bones of the extremity move, allows an extensive latitude for the various motions, and prevents the scapula from falling forwards or sternad on the thorax. This bone is present in all animals that extend their arms or anterior extremities frequently forwards, while it is wanting in those which use

the anterior extremities only for progressive motion, as the pachydermata, ruminantia, and solipeda.

In the fetus, the clavicle is completely ossified, and follows the ribs in arriving at perfection; resembles the long cylindrical bones in its structure, though fully more dense at its extremities. Its fracture is oblique and splintery; and it is frequently necrosed, and subject to exostosis from syphilis.

The scapula, *Figs.* 1 and 2, Plate VII., is situated at the superior and dorsal aspect of the thorax, as is represented in *Fig.* 1, Plate II., *k*, as also in Plate I., where the dorsal aspect is represented in outline; is a thin flat triangular bone; *a*, *a*, indicating its inferior costa; *b*, *b*, its superior costa; and *c*, *c*, its base; *d*, its superior posterior angle; *e*, its anterior angle; and *f*, its inferior angle. The external surface or dorsum *g*, of the bone, is slightly convex, and is divided into two unequal portions, by a high ridge *h*, named the spine, which terminates in the acromion process 6: to the upper or atlantal edge of this spine and acromion, is attached the remainder of the trapezius muscle, the rest being connected to the clavicle at 1, 1, *Fig.* 1, Plate II.; to the inferior or sacral margin is attached the rest of the deltoid muscle, the other portion arising from the clavicle 4, 4, *Fig.* 1, Plate II.: 8, of *Fig.* 2, indicates the small smooth surface to which the clavicle is articulated. The portion of the bone *g*, between the spine *h*, and the superior costa *b*, *b*, is occupied by the supra-spinatus muscle, and hence termed the supra-spinal fossa: the inferior portion *g*, between the spine *h*, the anterior costa *a*, *a*, and the base *c*, is occupied by the infra-spinatus muscle, and therefore styled the infra-spinal fossa: both on this surface, near the spine, and on the supra-spinal fossa, the chief medullary arteries enter. The digit 5 indicates the coracoid process, around the tip of

which, where 5 is placed, is attached the pectoralis minor, the coraco-brachialis, and the short head of the biceps flexor cubiti muscles; to its acromial edge 7, *Fig.* 1, is attached the strong ligament that extends to the acromion process 6, named the proper anterior ligament of the scapula: the two doted lines in *Fig.* 2 pointing out its situation. To the root of this process 9, where it is rough, and sometimes raised to a tubercle, the conoid and trapezoid ligaments, which keep the clavicle in position, are attached; and also a small ligament, stretching across the supra-scapulary notch *a*, termed the proper posterior ligament of the scapula; this, therefore, is a hole in the fresh state, and transmits the supra-scapulary nerve, artery, and vein: a dotted line indicating where the ligament is stretched. From this ligament, and part of the superior costa *b*, the omo-hyoideus muscle derives its origin. Into the part of the base *c*, *c*, superior to the spine, is inserted the levator scapulæ muscle; into the portion, between *c* and *c*, opposite to the spine *h*, is inserted the rhomboideus minor; and into that from *c* to c, is inserted the rhomboideus major: these rhomboidei are, however, actually one muscle. Into the edge of the base, from the superior posterior angle to the inferior angle, letters *k*, *Fig.* 2, between the insertion of these muscles, and the circumference of the subscapularis muscle, which occupies all the concave venter, letters *i*, is inserted the serratus major anticus muscle. The letters A, *Fig.* 1, point out the surface from which the teres major derives its origin, and *a*, *a*, situated on the margin of the bone, the long smooth surface for the teres minor. The inferior angle, at *f*, is flattened by the latissimus dorsi, which passes over and adheres to the scapula. Between the smooth surface, occupied by the teres minor, and the fossa formed by part of the subscapularis, is a ridge a, that gives origin to the

long head of the triceps muscle. The digits 2 represent what is named the cervix, which gives attachment to the capsular ligament, and, after surrounding the smooth head *c*, of the os brachii, *Figs.* 3 or 4, is fixed to the cervix, letters *e*, of that bone: the letter *e*, *Figs.* 1 or 2, indicates the anterior angle, or glenoid cavity, which is extremely shallow, of an oval shape, and adapted to receive the smooth head *c*, of the os brachii, *Figs.* 3 or 4. At the upper point of this cavity is a smooth surface 3, that affords attachment to the long head of the biceps.

In this manner, the scapula is articulated to the os brachii, or *vice versâ*, so as to allow free motion in every direction; and were it not for the acromion process, the proper anterior ligament of the bone, and the coracoid process forming nearly the half of the circle around the joint, dislocation would be very frequent. As it is, it is the joint most frequently dislocated. The short muscles around contribute much to strengthen the joint. The scapula is connected by its acromion process to the scapulary end of the clavicle; but it is also held in position by the several muscles already mentioned as attached to the bone. Its motions will be better understood after the description of the bone of the arm.

In the fetus, the anterior angle or glenoid cavity, the coracoid process, the acromion process, and the base of the scapula, are cartilaginous.

In its structure, the scapula resembles the other flat bones, with this difference, that by the action of the muscles on each side, its body becomes thin and diaphanous. Fracture of this bone is not very common, and when the accident does occur, generally the acromion process, or inferior angle, is the portion; seldom the coracoid process or cervix of the bone; and in these cases the fracture is transverse. This bone is sometimes necrosed,

—an instance of which I witnessed a few years ago, on which occasion I took a drawing of it.

Fig. 3 represents an anterior view of the os brachii, and *Fig.* 4 a posterior one. The letters and figures refer to both. The letters *a* indicate the body or shaft of the bone; *c*, *b*, the extremities or epiphyses; *c* indicates the smooth head which rotates in the glenoid cavity of the scapula, and is surrounded with the capsular ligament fixed into the rough circular groove named cervix, letters *e*; *f*, *g*, are two tubercles, divided by a fossa *h*, on the anterior aspect; the internal or ulnar tubercle *f*, is the smaller, and affords attachment to the subscapularis muscle; the external, or radial, *g*, *Fig.* 3, extends round to the back of the bone, or anconal aspect, and has three smooth surfaces; the superior, *g*, *Fig.* 3, has inserted into it the supra-spinatus muscle; the middle one g, *Fig.* 4, the infra-spinatus muscle; and the inferior posterior, or anconal, g, *Fig.* 4, the teres minor. The letters *h* indicate the fossa made by the long tendon of the biceps, which is continued a little way further down the bone by two ridges extending from each tubercle; into the ridge *m*, continuous with the inner tubercle, is inserted the conjoint tendon of the latissimus dorsi and teres major muscles; and into the ridge *n*, continuous with the outer tubercle, the pectoralis major muscle: this last ridge extends downwards on the bone to *o*, and is then reflected upwards and outwards; and to this is attached the deltoid muscle. On the ulnar margin, opposite to this, is a scabrous surface *i*, *i*, somewhat in continuation with the inner ridge, into which is inserted the coraco-brachialis muscle; and near this is seen the foramen that transmits the nutritious vessels. On each side of the rough triangular surface *o*, into which the deltoid is inserted, the brachialis internus muscle arises, and continues to proceed from this aspect of the bone

downwards to the condyles *p*, *q*. On the posterior, or anconal aspect, *Fig.* 4, is an interrupted ridge *r*, *r*, almost continuous with the external large tubercle, from which arises the second head of the triceps; and from the ridge *s*, *s*, arises the third head of the triceps: this united muscle passes downwards on the bone, adhering and rendering it smooth and somewhat flat, like the brachialis internus on the anterior aspect. Between the ridges which give origin to the second and third heads of the triceps, is a shallow spiral channel *t*, *t*, made by the spiral nerve. From this point the bone is bounded by two sharp ridges *k*, *k*, and *l*, *l*, which terminate in the condyles *p*, *q*; and to each of these ridges are attached intermuscular ligaments; to the external or radial *k*, *k*, and the condyle *q*, the supinator and extensor muscles; and to the internal or ulnar *l*, *l*, and the condyle *p*, the pronator and flexor muscles. From the highest part of the radial ridge at the upper *k*, arises, first, the supinator radii longus; secondly, the extensor carpi radialis longior and brevior; thirdly, the extensor digitorum communis; fourthly, the extensor carpi ulnaris; and, lastly, the supinator radii brevis: and from this radial condyle also, there extends a strong lateral ligament, which is afterwards fixed to the neck of the radius *c*, *Fig.* 6. The internal or ulnar ridge *l*, and condyle *p*, afford origin, first, to the pronator radii teres; secondly, to the flexor carpi radialis; thirdly, to the palmaris longus; fourthly, to the flexor digitorum sublimis; and, lastly, to the flexor carpi ulnaris: and from this condyle also, a strong lateral ligament extends to the inside of the coronoid process 4, of the ulna, *Fig.* 5. Behind this internal condyle is a fossa v, made by the ulnar nerve.

Between these condyles is the trochlea or pulley *b*, which in the posterior view, *Fig.* 4, appears single in consequence of the ulna only being articulated to it; and in

this aspect the greater sigmoid cavity, *x*, is seen that receives the olecranon process 5, *Fig.* 5. The anterior or palmar aspect of the trochlea, *Fig.* 3, appears double in consequence of both the ulna and radius being articulated to it: upon *d*, the smooth cup-like cavity *e*, of the head of the radius plays; upon *b*, the ulna moves; and the lesser sigmoid cavity *y*, receives the coronoid process 3, of the ulna, *Fig.* 5.

The os brachii is articulated by its smooth head *c*, through the medium of the capsular ligament, powerfully strengthened and supported by the strong short muscles around the joint, and by the long tendon of the biceps which runs within the ligament. As there are no lateral ligaments, free and extensive motion is performed at this joint, which admits both of revolving and sliding. When the os brachii is raised to a right angle with the scapula, it cannot be raised higher, but by the scapula moving on the clavicle and the clavicle on the sternum. The scapula moves on the clavicle forwards and backwards, describing a curve round an axis; also outwards and inwards on another axis perpendicular to the first, and between the scapula and os brachii. The clavicle likewise moves on the sternum in a varied and extensive manner.

In consequence of the free motion allowed at the shoulder joint, the os brachii is peculiarly subject to dislocation. This takes place commonly downwards on the inferior costa, but towards one side of the long head of the triceps; and as there are several muscles on the outside to protect the joint, the head of the os brachii slips out between this head of the triceps and the subscapularis muscles. Dislocation also takes place beneath the last muscle and the venter of the bone, or the origin of the muscle; and below the spine of the scapula, beneath the infra-spinatus, or between it and the teres minor muscle. When dislo-

cation occurs upwards, fracture of the acromion process must happen. In the reduction of the joint, the patient should be bled to syncope, in order to relax the muscles.

In the fetus, both extremities are cartilaginous, and the head with the two tubercles, and the condyles with the trochlea, become epiphyses before they are united to the shaft of the bone. This will be better understood by reading the description of the thigh bone, and examining *Fig.* 10 of Plate IV. It is of importance to recollect that the head of the os brachii and the condyles are not united to the body of the bone till near puberty, as they are liable to be forced off and to be mistaken for fracture.* In its structure, this bone resembles the other long cylindrical bones, see Plate IV., *Fig.* 10, with description. When the shaft is fractured, the direction is oblique and splintery; when the epiphyses are broken, the fracture is transverse; these extremes are subject to caries; the body to necrosis.

Figs. 5 and 6 represent the two bones of the fore-arm, the ulna is marked 1, 1, and the radius, *a*, *a*. The ulna is the longer, and the more triangular of the two, and resembles the other long bones in having a body, 1, 1, and two epiphyses or extremities, 6, 14; the larger extremity being proximad, the smaller distad. Its proximal extremity, or olecranon, has a flat triangular surface, 6, on which we rest, named ancon; on the radial aspect of this is another somewhat triangular surface, 7, 7, where the anconeus muscle is inserted and situated; the olecranon turns up and forms an acute point, 5, to correspond with the greater sigmoid cavity, *z*, of the os brachii, *Fig.* 4;

* Last summer I was called by a surgeon in town to a boy of 14 years of age, who, in running down a hill, stumbled and displaced the condyles of the os brachii: the treatment recommended in page 120 was adopted, and the condyles united to the shaft of the bone.

and between this acute point and the ancon, the bone is roughened, 2, by the insertion of the triceps muscle. The digit 3, of *Fig.* 5, indicates the coronoid process into which the brachialis internus is inserted; a little below this, the bone is roughened to give a stronger insertion to the muscle, and between this and the olecranon, a large sigmoid cavity, 8, 8, is formed, divided by a longitudinal ridge to correspond with the trochlea of the os brachii: the small dark line across represents a fossa, which lodges mucilaginous glands. On the radial side of this, a small sigmoid cavity is observable where the button-like head, *d*, of the radius rotates; and around the brims of these two sigmoid cavities, the bone is rough where the capsular ligament, which surrounds the head of the radius and pulley of the os brachii, is implanted. On the side of the coronoid process opposite to that where the less sigmoid cavity is situated, is a smooth depression where the flexor digitorum profundus begins to arise; and from each side of the coronoid process and olecranon, portions of both the flexors and extensors, and also a portion of the short supinator muscle arise.

The body of the ulna is somewhat triangular by the action of these various muscles: the angle marked with the digits 10, that points to the radius, and to which is attached the interosseous ligament, is the most acute. Near the proximal third on the anterior or palmar aspect, the foramen, 11, *Fig.* 5, for the medullary vessels is seen, which slants upwards or proximad. From the anconal aspect immediately below the insertion of the anconeus muscle 7, the three extensor muscles of the thumb and the indicator arise, while the extensor carpi ulnaris is attached to the ridge or angle, 12, 12, nearly throughout. At the distal extremity, from the thenal or palmar aspect, an oblique ridge, 18, 18, extends round to the styloid

process, 14, and gives attachment to the pronator quadratus muscle. The bone then terminates in a small round head with a cervix and process; on the radial side there is a smooth semilunar surface, 13, that rotates on a corresponding cavity of the radius, and is inclosed in a distinct capsular ligament, named sacciform, inserted into a rough edge around; and from the styloid process 14, projecting from the head, there extends the strong external or ulnar lateral ligament of the wrist joint, to be attached to the cuneiform, *c*, and pisiform, *d*, bones of the carpus. On the anconal aspect, between this styloid process, 14, and the smooth articular surface, 13, is a small groove, 15, made by the extensor carpi ulnaris. A similar groove, 16, is observable between these on the thenal or palmar aspect, made by the ulnar nerve and artery. Pointing directly distad, is a small semicircular smooth surface, 17, which moves on the cuneiform bone, *c*, of the carpus, and between these is interposed a doubly concave moveable cartilage.

In the fetus the ulna consists of its body and two cartilaginous epiphyses; its structure, therefore, resembles precisely that of the other long bones, see Plate IV., *Fig.* 10, with description. Its fracture also corresponds with theirs. In dislocation of the radius and ulna forwards on the palmar aspect of the os brachii, the olecranon process is fractured in consequence of its length and the great power of the triceps muscle which retains hold of the bone; and the fracture is transverse. This bone is also subject to necrosis in its body, and to caries in its extremities; and the proximal extremity on which we lean, or the ancon, is very subject to exostosis in the syphilitic constitution.

The radius marked *a*, *a*, in *Figs.* 5 and 6, forms the other bone of the fore-arm, and like the ulna consists of a

body and two extremities; but the upper extremity, *d*, is smaller than the lower or distal, *s*. The letter *d* indicates the smooth circular surface, the ulnar half of which rotates in the smaller sigmoid cavity of the ulna, the whole being surrounded with a thickening of the capsular ligament, named coronary ligament; *e*, the cup-like cavity which moves on the outer surface, *d*, of the trochlea of the os brachii, *Fig.* 3; *c*, the cervix around which the capsular ligament of the elbow joint is implanted; and *b*, the tubercle into which the tendon of the biceps is inserted. Extending downwards from this, on the palmar aspect outwards to the radial edge, is a delicate ridge, *f*, into which the supinator radii brevis is inserted, and from which the flexor pollicis longus begins to arise; and in a manner continuous with this ridge, and somewhat on the anconal aspect of the radial ridge, is a scabrous surface, *g*, into which the pronator radii teres is inserted. Below the ridge, *f*, and beneath the origin of the flexor longus pollicis, the passage, *i*, for the medullary vessels is seen slanting upwards. The body of the bone is flattened on this palmar aspect, as well as on the anconal aspect, by the different muscles of the fore-arm, while it is rounded on the radial by the extensor muscles of the thumb; and towards the ulnar aspect the bone terminates in an acute angle, letters *h*, to which is attached the interosseous ligament. This ligament is deficient between the proximal extremities of the bones, where there is no acute edge on either bone.

The radius terminates in an end, larger and broader, distad than proximad; and near this end, on the palmar aspect, the bone is flat, and a little rough at *k*, where the pronator quadratus is inserted. Radiad to this at *l*, a little rough surface is observable, into which the supinator radii longus is inserted. On the anconal aspect, the ex-

tremity is divided by a small tubercle, *n*, which extends proximad so as to form a ridge; ulnad to this a small groove, *o*, is made by the tendon of the extensor secundi internodii pollicis; and between this and the ulna is a larger groove, *p*, made by the extensor digitorum communis and indicator muscles: on the radial side of the little tubercle, *n*, is a corresponding broad depression, *q*, sometimes divided into two, made by the two radial extensor muscles; and still more radiad to the last is a small groove, *r*, made by the other two extensors of the thumb. Near this groove, *r*, the bone projects so as to form a styloid process, *s*, from which extends the radial or internal lateral ligament, to be attached to the os naviculare, *a*, of the carpus. The radius then forms an irregular oblong cavity, *t*, named the greater sigmoid, that receives the os naviculare, *a*, and os lunare, *b*, of the carpus; and around this smooth surface there is a ridge that gives attachment to the capsular ligament, which, after surrounding the smooth surfaces of these two bones, and the cuneiform bone of the wrist, is implanted into them. On the ulnar aspect of this cavity is a smaller, of a semilunar shape, *z*, named the lesser sigmoid cavity, to receive the distal end, 13, of the ulna; and around which is attached the sacciform ligament.

In its fetal state, and in its structure, the radius corresponds with the ulna: and excepting not being subject to exostosis in the syphilitic constitution, is liable to the same diseases.

These two bones enter into the formation of the elbow joint by their proximal ends, and are firmly articulated to the trochlea of the os brachii, by capsular and lateral ligaments, and powerfully supported by muscles; therefore, flexion and extension only are allowed. This forms one of the best specimens of the ginglymoid or hinge-like

joint, and admits only of a sliding motion. Dislocation may take place either forwards or backwards; the latter, however, is more frequent: when the bones of the fore-arm are forced forwards, or palmad, the olecranon, as previously observed, must be fractured. If the injury done be so great as completely to dislocate these bones laterally, amputation generally becomes necessary. Sometimes an incomplete dislocation laterally occurs. Sometimes in children the head of the radius is dislocated backwards. The distal extremity of the radius is not so often displaced as the distal end of the ulna; and this takes place either forwards or backwards. Pronation, or the palm of the hand turned downwards, is performed by the head of the radius rotating on the lesser sigmoid cavity of the ulna, and by the distal end of the radius revolving on the smooth distal extremity of the ulna. Supination, or the palm of the hand turned upwards, is performed by the same surfaces. In each of these motions, however, the whole arm is generally called into action.

Figs. 7 and 8 are representations of the bones of the hands; *Fig.* 7 is a posterior or anconal view, and *Fig.* 8 a palmar or thenal view. The bones of the hand are divided into those of the carpus, which are eight in number, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*; into those of the metacarpus, which are five in number, and are marked 1, 2, 3, 4, 5; and into those of the phalanges, which are three to each finger, 7, 11, 16; 8, 12, 17; 9, 13, 18; 10, 14, 19, excepting the thumb, where there are only two, 6, 15.

Of the bones of the carpus, *a* is the os scaphoides, *b* the os lunare, *c* the os cuneiforme, *d* the os pisiforme, *e* the os trapezium, *f* the os trapezoides, *g* the os magnum, and *h* the os unciforme. The scaphoides and lunare have each a smooth convex surface, where the letters *a* and *b* are placed, by which they are articulated to the

radius in order to form the wrist-joint; and around these surfaces the bones are rough for the firm adhesion of the capsular ligament. The scaphoides, *a*, is articulated to the lunare, *b*, by a semilunar plane, to the magnum, *g*, by a smooth concavity, and to the trapezoides, *f*, and trapezium, *e*, by a small convex surface. All these surfaces have capsular ligaments surrounding them, and strong transverse ligaments passing from one bone to another. As this ligamentous arrangement pervades the bones of the carpus, I shall not mention them individually. This bone, as already noticed, affords attachment to the radial lateral ligament.

The os lunare, *b*, exhibits its convex surface where it enters into the formation of the wrist-joint, as already mentioned, and is articulated to the scaphoides, *a*, by a crescentic plane. This bone also contributes by a semilunar concavity, to form the socket for the head of the os magnum, *g*, and is articulated by a narrow oblong sinuosity to the os unciforme, *h*, and by a small convexity to the os cuneiforme, *c*.

The cuneiform bone, *c*, has a concave surface, corresponding to that of the lunare, to which it is joined; a small slightly convex surface opposed to the lower end of the ulna, on which it moves through the medium of an interarticular cartilage, and which the capsular ligament of the wrist joint surrounds; an oblong and somewhat spiral concavity, by which it is articulated to the unciform bone *h*; and a circular plane for articulation with the pisiform bone *d*. Its ulnar and somewhat anconal aspect, is rough for the attachment of the ulnar lateral ligament of the wrist-joint.

The pisiform bone, *d*, is attached only to the last bone. It affords attachment to the same lateral ligament as the cuneiform bone, and affords insertion to the flexor carpi

ulnaris; contributes to give attachment to the palmar annular ligament, which is stretched between this bone, the unciform bone, *k*, and the trapezium, *e*; gives origin to the abductor minimi digiti muscle; and has a small depression on its radial aspect, formed by the ulnar nerve.

The os unciforme, *k*, has a surface corresponding to that of the cuneiform bone, *c*, to which it is articulated, only irregularly convex; a small convexity to correspond with the sinuosity described under the os lunare, *b*; a long and slightly convex surface adapted to the os magnum, *g*; and two small concave surfaces at its distal extremity, on which rest the metacarpal bones of the little, 5, and ring, 4, fingers. From its palmar aspect projects a thin broad process resembling a hook, the radial aspect of which is hollow, to afford passage to the tendons of the flexor muscles of the fingers, which are held in position by the annular ligament attached to this process. The flexor and adductor muscles of the little finger partly arise from this process.

On the ulnar aspect of the os magnum, *g*, is a concave surface to correspond with that of the bone last described, to which it is articulated. Its round head corresponds with the concavity formed between the lunar, *b*, and scaphoid, *a*, bones. Its distal aspect supports three of the metacarpal bones: that, 4, of the ring finger forms a small flat surface; that, 3, of the middle finger, rests on a large triangular surface; and that, 2, of the fore-finger, makes a considerable oblong depression, only seen in the palmar view. On the radial side a short plain surface joins this bone to the os trapezoides.

The trapezoides, *f*, has a small surface corresponding with that of the last bone; a distal convex surface, which sustains the metacarpal bone, 2, of the fore-finger; a long convex surface by which it is articulated to the trapezium,

e; and a small hollow surface for connexion with the scaphoides, *a*.

The trapezium, *e*, has an oblong concave square to correspond with the trapezoides, *f*; a smooth semicircular slightly concave surface for connexion with the scaphoides, *a*; a small oblong smooth surface formed by the metacarpal bone, 2, of the fore-finger; and a pulley-like surface by which it is articulated to the metacarpal bone, 1, of the thumb. On its palmar aspect, is a projection that gives attachment to the palmar annular ligament, and the abductor pollicis and flexor ossis metacarpi pollicis muscles. Between this elevation and the palmar aspect of the bone, is a groove made by the flexor carpi radialis muscle.

The wrist-joint, the formation of which has been described, admits of flexion and extension, and a lateral and slightly rotatory motion; all performed chiefly on the sliding principle. This is not so marked a ginglymoid joint as that of the elbow. Although strongly protected by ligaments and muscles, yet from the free motions this joint performs, and its exposed nature, dislocation frequently occurs: this takes place in every direction, but that backwards or anconad is the most common, partly owing to the nature of the accident which generally occasions it, and partly from the brim of the cavity of the radius not being raised so much anconad as palmad.

The bones of the wrist are so articulated as to form an arch, which is well supported by ligaments, and to allow only a yielding motion; excepting between the scaphoides lunare and magnum, where motion forwards and backwards takes place, which increases considerably the motions of the wrist. From the strong arched connexion of these bones, they are scarcely ever displaced; the os magnum alone has been known to be forced anconad, the only direction in which any of them can be dislocated.

The carpal bones are all cartilaginous at birth, and in their structure resemble the bodies of the vertebræ, so that when one is attacked with caries the disease rapidly spreads to all, which is by no means unfrequent in the scrofulous constitution.

The bones of the metacarpus are five in number, and are marked 1, 2, 3, 4, 5. They resemble the long cylindrical bones in having a body and two epiphyses, the latter of which are cartilaginous at birth. Their bodies are flattened on their anconal aspect, acutely angular in their palmar aspect, and depressed on each side between these surfaces. Their proximal extremities or bases are enlarged, and of a triangular shape, somewhat hollowed to correspond with similar surfaces on the carpal bones, to which they are articulated by capsular and transverse ligaments, like the carpal bones themselves. They are also flat and smooth on the sides where they are contiguous to each other. Their distal extremities or heads are enlarged, and have smooth oblong surfaces by which they are articulated to the roots of the first phalanx, 7, 8, 9, 10; and around these smooth surfaces a rough edge affords attachment to capsular ligaments. On each side of these heads are little tubercles, to which are attached transverse ligaments, which tie them together. Close to these tubercles are small depressions, to which are fixed lateral ligaments. The metacarpal bone, 1, of the thumb differs from the others in having a shorter body, a flatter head, and a pulley-like surface on its base, to correspond with a similar surface of the trapezium, *e*: both of these surfaces are surrounded with a strong capsular ligament, and perform free motion, as flexion, extension, and rotation,—hence this joint is liable to be dislocated, and the direction is anconad. In the skeletons of old labourers, two small bones, named sesamoid, are generally found on

the palmar aspect of the head of this metacarpal bone, at 20, *Fig.* 8. I have already described the manner of articulation of the other metacarpal bones with the carpal, excepting that they have capsular and transverse ligaments, in consequence of which little motion is allowed. That of the little finger has most; next that of the ring finger; then that of the middle; and last of all that of the fore-finger. Dislocation of these articulations has never taken place. The metacarpal bone, 2, of the fore-finger, is generally the longest; into the anconal aspect of its base, the long head of the extensor carpi radialis is implanted, and to the opposite aspect or palmar is attached the flexor carpi radialis: the tubercle on the radial side of its head is the larger of the two. The metacarpal bone of the middle finger is generally the second in length, but it is often as long as, or even longer than the preceding, which sometimes arises from the os magnum not advancing so far distad as it generally does. The fact of these bones, as well as the carpal bones, varying a little in their size and connexions, is of some consequence to be known by the operator, otherwise he may be deceived when one of them requires to be extirpated. To the anconal aspect of the base is attached the short head of the extensor carpi radialis; and to the anconal and somewhat ulnar aspect of the base of the little finger is attached the extensor carpi ulnaris.

As the structure of these resembles that of the long cylindrical bones, their diseases are the same. They are very subject to necrosis.

The bones of the first phalanx, 6, 7, 8, 9, 10, resemble the metacarpal bones in having a body and two epiphyses, which latter are cartilaginous at birth. Their proximal extremities or bases have oblong cavities, to correspond to the heads of the metacarpal bones, with which they are

articulated by capsular and lateral ligaments; the former are attached all round the smooth surfaces of both bones, and the latter to the little elevations or tubercles on each side. The bodies of these bones are convex on the ancoeal aspect, in consequence of the expanded tendons of the extensors, and slightly concave, or flat on the palmar by the flexor tendons, with a ridge on each side, marked 21, to which the vaginal ligaments of these flexor tendons are attached. The distal ends have a trochlear or pulley-like surface, and a central depression with a lateral elevation, to correspond with the proximal ends of the bones of the next phalanx; and around these are attached capsular ligaments. There are small lateral tubercles for lateral ligaments. The proximal ends, with the metacarpal bones, perform free motion, as flexion, extension, and slight rotation, excepting that of the thumb, which is limited in this latter motion. These joints are sometimes dislocated, the base of the first phalanx being forced palmad. They are also dislocated in the other directions, but not so frequently. In their structure, and consequently in their diseases, they resemble the metacarpal bones.

The bones of the second phalanx, 11, 12, 13, 14, of which the thumb has none, resemble those of the first phalanx, excepting in their proximal ends or bases, where the articular surface has two lateral cavities and a middle elevation. They are also short, and have slight rough surfaces, marked 22, to which the tendons of the flexor sublimis are attached. The mode of articulation, the fetal state, the structure, and the diseases, are the same as those of the first phalanx. This joint, however, admits only of flexion and extension.

The bones of the last phalanx, 15, 16, 17, 18, 19, are still shorter than the last. Their articular surfaces resemble the proximal ones of the preceding phalanx;

therefore, these two series of articulations correspond with each other. Their palmar aspects are rough at 23, to afford insertion to the tendons of the flexor profundus. Their distal ends are tipped with an arched scabrous surface, to give support to the delicate tissue of nerves, vessels, and fat, where sensation chiefly resides. Their anconal aspects are smoother, to give rest to the nails. The joint formed by the proximal ends of this last series of bones, precisely resembles the contiguous articulation, and admits of only flexion and extension: like it, this joint can be dislocated in every direction, and like it, too, generally palmad. In the fetal state, its proximal extremity is cartilaginous, and continues an epiphysis till maturity.

When we take a review of the upper extremity, we perceive how well the hand is adapted for prehension, and how, by multiplying the motion of the phalanges by all the other motions of the extremity, so great a variety of motions is performed; for they even extend to the motion of the clavicle on the sternum. We also find, that when the trunk is fixed, we can bring objects to, or push them from it; and when the fingers are made the fixed point, that we can bring the trunk to, or remove it from them.

PLATE VIII.

Figs. 1 and 2 have been already described along with Plate III., as they refer to the same subject.

Fig. 3 is a representation of the anterior or patellar aspect of the thigh bone; *a*, *a*, is the body or shaft of the bone, of a smooth round shape, with a rough line * poste-

* This is generally termed linea aspera.

riorly or poplitead, extending longitudinally, as seen in *Fig.* 4, *a*, *a*. The extremes of the bone are named epiphyses, and are analogous to all the long bones. *Fig.* 4, the posterior view will also be here described. At the upper extremity, where the os femoris is articulated to the acetabulum of the os innominatum, is the head *b*, which is smooth and round to correspond to that cavity. Nearly in the centre, a little inwards or pubic, where the bone is articulated, is a small circular depression *c*, that gives attachment to the round ligament fixed by its other extremity to the acetabulum. This attachment of the ligament should be considered in reference to amputation of the hip-joint. At the root of the head the bone is smaller in circumference, and is termed the cervix, *d*, which extends to the shaft of the bone, and is bounded by two large processes, the trochanter major, *e*, and the trochanter minor, *f*, and by a ridge extending between both of these, anteriorly *g*, and posteriorly *h*. The capsular ligament, arising round the acetabulum, begins to be attached at the root of this cervix, near the trochanters and ridges; and adhering closely to the bone, ascends and terminates around the root of the smooth head. The angle formed by the neck and body of the bone should be considered in amputation at the hip-joint.

The trochanter major, *e*, has three flattened surfaces: the anterior, where *e*, *Fig.* 3, is placed, gives insertion to the gluteus minimus; *e*, the superior surface, gives insertion to the gluteus medius; and the posterior, e, is made by the gluteus maximus passing over it, and which is inserted into the outer division of the linea aspera, a, a. The trochanter minor, *f*, gives insertion to the psoas magnus and iliacus internus muscles, and the posterior ridge, *h*, that extends between the trochanters, gives insertion to the quadratus femoris muscle. The anterior ridge, *g*, is caused

by the capsular ligament and part of the origin of the crureus muscle. Into the pit, or rut, at the root of the trochanter major, *i*, are implanted several muscles, viz. the pyriformis, obturator externus, and obturator internus, with the two gemelli.

The superior internal, or tibial division of the linea aspera, a, gives insertion to the pectinalis muscle; from the insertion of which, along the linea aspera to the tubercle *k*, behind the internal condyle, are inserted the three adductors, or heads of the triceps muscle. Near the beginning of this lower internal ridge, is a discontinuation of the linea aspera *l*, where the superficial femoral artery with its vein passes between the bone and the tendon of the triceps. From the whole of the inside of the linea aspera, more inwards, or tibiad, than the triceps, originates the vastus internus. From the whole of the outside of the linea aspera, more outwards than the insertions of the gluteus maximus and triceps, arises the vastus externus, which muscle proceeds also from the outer division of the linea aspera, ending at the external condyle. The crureus, which is strictly the central portion of the two vasti, arises from the anterior ridge *g*, and the anterior aspect of the body of the bone *a*, *a*; and hence these three muscles nearly surround the bone. The linea aspera at its centre *a*, *a*, also gives origin to the short head of the biceps, which lies between the insertion of the triceps and origin of the vastus externus. At the upper part of the linea aspera is seen the foramen *o*, where the medullary vessels enter and proceed obliquely upwards. The linea aspera divides inferiorly as well as superiorly; and at the termination of each of these divisions, is a small tubercle *k*, *p*; into the internal or tibial *k*, as I have already observed, the termination of the tendon of the triceps muscle is inserted. Immediately below, or distad to this, is a small smooth

surface *r*, from which arises one of the heads of the gastrocnemius externus. To the inner or tibial aspect of this tubercle is attached the internal lateral ligament. Two of the inner ham-string muscles generally make a slight depression at this point. From the external or fibular tubercle *p*, arises the other head of the gastrocnemius externus, as well as the external lateral ligament; and the bone is also depressed by the outer ham-string muscle. The fossa *s*, affords origin to the popliteus muscle. Distad to each of these small tubercles, the bone ends in a large protuberance, named condyle, *m*, *n*, which is smooth and circular for articulation with the head of the tibia *c*, *c*, *Fig.* 8. Each smooth surface of a condyle is divided into two parts: *m*, *n*, of *Fig.* 4, indicate the surfaces which move on the tibia; while *m*, *n*, of *Fig.* 3, point out those on which the patella, *Fig.* 6, moves, where a correspondence of surfaces is observable. Thus *n* of the patella, is applied to *n* of the os femoris, *Fig.* 3; and hence the external condyle is the highest and largest. From the oblique position of the bone, the internal condyle is the longest, while it gives less obliquity to the leg. The surfaces on each condyle are indistinctly separated, those of the external by a slight notch, and those of the internal by a small elevation. Between these condyles is a considerable cavity *t*, in which the crural vessels and nerves lie immersed in fat in the fresh state; and between this large notch and the lower bifurcation of the linea aspera, the bone is flattened by the same objects. To each side of this notch is fixed a strong ligament, termed crucial, extending to the elevation on the head of the tibia *b*, *Fig.* 8. The anterior is attached to the external depression in the side of the notch, the posterior to the internal depression which is more superficial than the other. The letter *t* points to these depressions. Around the smooth surfaces of the

condyles is a slight roughness to which the capsular ligament is attached, so as to include in the same joint the two surfaces *m*, *n*, of the patella, *Fig.* 6. Exterior to the capsular ligament, between the letters *n*, *p*, of *Fig.* 4, arises, from the external condyle, the posterior ligament, styled popliteal, which crosses the posterior part of the articulation, adheres to the capsular ligament, and terminates at the superior, posterior, and internal part of the head of the tibia.

In the fetal state the os femoris is cartilaginous in all its processes, an idea of which may be formed from *Fig.* 10, Plate IV., in which the section of the adult bone shows the lines where the cartilage unites the epiphyses that grow upon the body or shaft, and which are marked *a*, *a*, *b*, *b*, *c*, *c*.

The os femoris is articulated by its head to the acetabulum, R, *Fig.* 2, of the os innominatum, by a very strong capsular, and by a round ligament; and, as I remarked under the description of the os innominatum, page 27, we should imagine dislocation of this joint to be of rare occurrence. By the lower surfaces of the condyles, this bone is articulated to the tibia, by a capsular, by strong lateral, by the popliteal, and by crucial ligaments; anteriorly the joint is strengthened by a strong tendinous expansion of muscles, and, posteriorly, by tendons of muscles. From this strong attachment, and the configuration of the joint, which resembles a hinge, and is one of the ginglymoid class, it admits of only flexion and extension; while rotation can only be performed to a very trifling extent, when the knee is bent, or in the sitting posture. For these reasons, dislocation is very rare; and when it does occur, such injury is done to the joint itself, and the neighbouring parts, that violent inflammation follows, and almost always terminates in suppuration; so that the practitioner

has, in such a case, to consider the propriety of amputation. All the injuries of this joint which I have witnessed, whether from cannon shot, musket bullets, bayonets, penknives, or forks, or from severe bruises occasioned by falls, have invariably been followed by so extensive inflammation, that, in defiance of the lancet, leeches, and cold or warm applications, suppuration and hectic fever ensued, and carried off the patient. The great extent of delicate surface in this joint should be well considered by the practitioner.

The structure of the thigh bone is displayed in Plate IV., *Fig.* 10, which has been selected, as it best illustrates the variety found in the long cylindrical bones. Thus we observe, that the shaft or body, letters *d*, consists of a dense cylinder of bone, with few osseous cancelli, while the extremes, *a*, *b*, and *c*, have a delicate bony shell, and numerous delicate cancelli, like the body of a vertebra, *Fig.* 7. The letters *a*, *a*, *b*, *b*, and *c*, *c*, point out delicate white lines where the epiphyses are separated by cartilage in the fetal state, and which do not become obliterated by bony union till puberty, from which cause it happens, that in early life the head is sometimes displaced and mistaken for fracture. This should be taken into consideration in accidents at this period of life. In structure the extremities, or epiphyses, precisely resemble the vertebræ and other irregular round bones, and consequently, when the head, neck, or condyles are broken, the fracture is transverse; and, as the bone is delicate, it seldom unites by osseous junction. When the fracture occurs within the capsular ligament of the hip-joint, the synovial juice contributes to prevent union.*

* I have been told by Professor Dzondi of Hallé, that he has, however, seen several instances of bony union of the neck of the os femoris when fractured within the

When the body, *d*, is fractured, the direction is oblique and splintery, and, from the density, bony union readily takes place.

The hip-joint, as already observed, is subject to dislocation, and to the disease named morbus coxarius; the trochanters as well as the head are liable to exostosis and to caries: the condyles are equally subject to caries, particularly in white swelling of the knee-joint, and then anchylosis sometimes ensues, which is much to be desired in this case. Exostosis scarcely ever takes place here. The body of the bone is liable to necrosis, to exfoliation, to spina ventosa, and lastly to caries.

Fig. 5 is an external view of the patella or knee-pan: into *a*, *a*, are inserted the rectus and crureus muscles; into *b*, the vastus internus; and into *c*, the vastus externus muscle. To *d* is attached the strong patellar or anterior ligament of the knee-joint, the other end being fixed to the tuberosity *d*, of the tibia, *Fig.* 7. The surface of the patella where this ligament is attached, is better seen in *Fig.* 6, which exhibits an internal, or popliteal, view of the bone. The same letter, *d*, points out the rough surface. All round the margin of the bone, letters *e*, *Fig.* 6, is attached the capsular ligament of the knee-joint, so as to include in the cavity the surfaces, *n*, *m*, which, as I have already remarked, are applied to *n*, *m*, *Fig.* 3, of the os femoris: hence, *n*, is the external and larger surface. Between these two surfaces, *m*, *n*, there is an elevation

joint. A subject was brought into the dissecting rooms of St. Bartholomew's Hospital, in the winter of 1822, both of whose thigh bones had been fractured at the neck within the capsular ligament, and in both bony union had taken place; this, however, is doubted by that great surgeon Sir Astley Cooper. Another subject was brought into the Anatomical Rooms of 5, Surgeon's Square, Edinburgh, where the same was observable in one of these bones; but we are ignorant of the history of these cases, and they are therefore not fair data to draw any inference from.

which corresponds with the depression between the anterior superior surfaces of the condyles of the os femoris.

The patella in the fetal state is cartilaginous, and remains so, longer than any of the epiphyses of the long bones.

In the description the attachments of the bone have been already mentioned. From the unyielding nature of the patellar ligament, the patella moves along with the tibia in the motions of the knee-joint; and owing to these strong connexions, is seldom dislocated, and never unless the leg be extended. Dislocation is generally outwards, which proceeds, not from the articulation, but from the nature of the injury necessary to produce this accident. Fracture much more commonly occurs, and is always transverse. The structure is represented in Plate IV., *Fig.* 8, from which it will be understood, that the bond of union after fracture is ligamentous, or ligamento-cartilaginous. In its diseases the patella resembles the vertebræ, or rather the bodies of the vertebræ, and other round bodies.

Fig. 7 is an anterior or patellar view of the tibia and fibula, and *Fig.* 8 is a posterior or popliteal view. The larger bone, which is situated on the inside of the leg, is the tibia, as seen in the connected skeleton, Plate I. The tibia is of a triangular shape, but still resembles the other long cylindrical bones in appearance and structure. The letters *a* indicate the anterior or patellar angle or spine, termed in common language the shin; *d*, the tuberosity to which the patellar ligament is attached; and *c*, *c*, the head of the bone divided by *b*, a considerable irregular eminence, into two smooth oval depressions for the reception of the condyles, *m*, *n*, *Fig.* 4. These depressions, which are not equal, the internal being deeper and more

oblong, are deepened in the fresh state, by two corresponding semicircular cartilages attached to *b*, to one another, and to the condyles of the os femoris, and capsular ligament, which is attached all round the head of the tibia. The elevation *b* gives attachment also to the two crucial ligaments connected with the notch between the condyles of the os femoris. On the inside of the tuberosity *d*, is a broad rough surface *e*, into which the aponeurosis of the vastus internus, the sartorius, gracilis, and semitendinosus muscles are inserted, and to which the internal lateral ligament is attached. The attachment of these muscles should be considered by the operator in amputation of the leg. Posteriorly or poplitead to this, there is an elevation *f*, to which another ham-string muscle is attached, viz. the semi-membranosus: *g*, another elevation a little fibulad, gives attachment to part of the posterior crucial ligament; a little more fibulad to which is a slight depression or groove made by the popliteus muscle, as it passes down to be inserted into the oblique ridge, letters *k*, and smooth surface, letters *i*; and still more fibulad is a small flat circular surface, *h*, looking downwards, or distad, to which the head 2 of the fibula is attached.

Between the patellar or anterior angle, letters *a*, and the fibular angle, letters *m*, arises the greater portion of the tibialis anticus, and extensor longus digitorum pedis muscles; and from the angle, letters *m*, to the opposite angle, 4, 4, 4, of the fibula, is stretched the interosseous ligament. At the ridge *k* the foramen *n* is seen, which transmits the nutritious vessels; and from the lower margin of this ridge, and from the angle, letters *o*, in continuation, which is the posterior tibial, arise one of the heads of the gastrocnemius internus, part of the tibialis posticus, and flexor longus digitorum muscles. These

render the bone flattened between letters *o* and *m*, and, in passing round the inner ankle, or malleolus internus, *q*, to the foot, make the grooves, *n*, *p*: *n* is made by the action of the tibialis posticus, and flexor longus digitorum pedis; and *p* by another muscle, which arises chiefly from the fibula, viz. the flexor pollicis longus. At *q* the malleolus internus is a small notch, to which the chief portion of the internal lateral or deltoid ligament of the ankle-joint is attached; the other end being fixed to the inside of the astragalus *a*, and naviculare *b*, of the foot, *Fig.* 9. This end of the tibia has a large smooth hollow cavity, *r*, *r*, that forms the greatest part of the cavity adapted to receive the smooth head of the astragalus *a*, *Fig.* 9. On the fibular aspect of this, at *s*, is a rough depression that receives the distal extremity, 9, of the fibula.

In the fetal state the tibia resembles the other long bones; in the adult state it also resembles them in its configuration, as well as in its structure and diseases. Its anterior angle, letters *a*, and tuberosity *d*, are very subject to exostosis in the syphilitic constitution. This bone is also most liable to necrosis.

The fibula I shall describe before the attachments of the tibia, as the former enters into the formation of the ankle-joint. We observe that the fibula, marked 1, forms the outer bone of the leg, which is the smaller of the two, and of an irregular triangular shape. The digits 1 indicate its exterior angle, rounded by the action of the two peronei muscles, to which it gives origin; the digits 4 mark the tibial angle to which the interosseous ligament is fixed. From the anterior or patellar aspect between these angles, arise the remainder of the extensor longus digitorum pedis, and inferiorly or distad the extensor proprius pollicis pedis. From the popliteal aspect, between the angles superiorly at 6, arises the outer head of the

gastrocnemius internus; distad to this, the flexor longus digitorum, and tibialis posticus; and still more distad, the flexor pollicis longus. About the middle of this surface is seen the entrance 8, for the medullary vessels slanting downwards. The digit 2 is the proximal extremity which has a smooth surface, corresponding to that of the tibia, to which it is articulated by capsular and strong transverse ligaments, so that only a slight sliding motion backwards and forwards is allowed. On the outside of this, it is rough and protuberant, where the tendon of the biceps and the external lateral ligament of the knee-joint are attached.

The distal extremity 9 is oblong and spongy, and terminates in a rounded point, named the coronoid process, or malleolus externus 10, which projects further downwards, or distad than the malleolus internus; to this is attached the external lateral ligament divided into three parts, the anterior of which is attached to the forepart of the astragalus *a*, *Fig.* 9; the middle, termed perpendicular, to the os calcis; and the posterior to the back part of the astragalus. This process is smooth at 11, where it is opposed to a corresponding smooth surface of the astragalus a, by which it enters into the formation of the ankle-joint. At 12, is a rough irregular cavity, where mucilaginous glands are lodged, and at 13, there is generally a groove formed by the two peronei muscles passing round to the foot.

Under the description of the thigh bone, the manner of articulation of the upper end of the tibia, and the diseases to which it is liable, were detailed. The manner of articulation between the head of the tibia and fibula has been also described, and so strong are the transverse ligaments, that the bones are scarcely ever displaced. The two bones are tied together with equal strength at their

distal extremities, and seldom separated. Around the smooth surfaces both of the tibia and fibula, where they enter into the formation of the ankle-joint, is attached a capsular ligament, surrounding the smooth surface *a*, of the astragalus, *Fig.* 9, and inserted into a rough surface around it. There are also strong lateral ligaments. From the manner in which the astragalus is thus received and held in position, dislocation seldom occurs without fracturing either the malleolus internus or externus, or both; most frequently the latter, or the fibula a little higher up: in this accident the dislocation is lateral, and generally inwards. Dislocation forwards or backwards may take place without fracture of the bones.

From the structure of the fibula, which is analogous to that of the os femoris, this bone resembles it in the line of fracture when broken, as also in its diseases. In the fetal state the fibula likewise resembles the os femoris and other long bones.

Fig. 9 is a representation of the bones of the foot, which are divided into those of the tarsus, seven in number, *a*, *b*, *c*, *d*, *e*, *f*, *g*; into those of the metatarsus, five in number, 1, 2, 3, 4, 5; and into those of the phalanges, three to each toe, 8, 9, 10; 11, 12, 13; 14, 15, 16; 17, 18, 19; and two to the great toe, 6, 7. I have not given individual specimens, as they are extremely difficult to comprehend separately, and of little practical utility even if it were otherwise. The letter *a* indicates the os astragalus; *b*, the os naviculare; *c*, the os calcis; *d*, the os cuneiforme internum; *e*, the cuneiforme medium; *f*, the cuneiforme externum; and *g*, the os cuboides.

The astragalus has a large smooth surface *a*, flattened on each side by the action of the malleoli, or the distal processes of the tibia and fibula: a, indicates that which moves on the smooth surface 11, of the fibula, *Fig.* 7, and

is much larger than the internal or tibial surface. All round this the bone is smooth for the insertion of the capsular ligament of the ankle-joint, and rests on the os calcis *c*, by two smooth surfaces, between which is a rough groove for attachment to strong ligamentous bands passing between it and the os calcis: at *k*, there is a depression made by the flexor pollicis longus. Distad, or anterior to the distal of the two surfaces which rest on the os calcis, is a smooth surface looking to the sole of the foot, and resting on a strong broad ligament which extends between the os calcis and os naviculare. The distal or forepart of this bone is formed into an oblong smooth process *m*, that is received into a corresponding depression of the os naviculare *b*; around which smooth surface is a rough fossa giving attachment to a capsular ligament. Its connexions have already been described; and its diseases, as well as those of the other tarsal bones, will be taken notice of when the description has been completed. In the fetus, a considerable portion of this bone is ossified.

The letter *c* is the os calcis, and points to the most projecting part of the bone where the tendo-achillis, the united fibres of the four heads of the gastrocnemii muscles is inserted. Towards the tibial aspect or sole of the foot near where it is articulated to the distal or anterior of the two surfaces of the astragalus, is a strongly marked fossa *k*, made by the flexor pollicis longus; between this and the anterior of the two surfaces by which it is articulated to the astragalus, the bone is rough where the powerful ligament that supports the astragalus is fixed. Nearer the sole of the foot, where the bone is made hollow by the flexor muscles and vessels from the leg, is a slight fossa made by the flexor longus digitorum; and from this hollow the musculus accessorius flexoris longi digitorum proceeds. On the plantar aspect where the bone forms the

resting point of the arch, there is a considerable protuberance, which is in some measure divided into two; the internal or tibial, gives origin to the flexor brevis digitorum, the abductor pollicis, and part of the plantar fascia; and the external or fibular, gives origin to the abductor minimi digiti and rest of the fascia. The same surfaces, corresponding with those of the astragalus, are here formed, with a similar fossa between them. In the plantar aspect near its junction with the os cuboides, are a protuberance and depression that give attachment to the strong external plantar ligament extending to the os cuboides. At *c*, where it is articulated to the os cuboides, is a smooth pulley-like surface; and between the astragalus and os calcis at this part, is a large hollow where mucilaginous glands are lodged.

A large portion of the os calcis is ossified in the fetus, and the extremity, *c*, becomes afterwards an epiphysis.

The os naviculare, *b*, has an oblong concavity, corresponding with the process, *m*, of the astragalus. At the tibial aspect, there is a considerable knob, into the plantar surface of which the tibialis posticus muscle is inserted; this should be considered by the operator in injuries of the toes requiring amputation, as the preservation of this bone would assist in the extension of the ankle-joint: to this knob, or eminence, are also attached part of the abductor pollicis and two ligaments of the sole of the foot; the one, namely, the internal plantar ligament, has been already mentioned; the other extends to the roots, or proximal extremities of the metatarsal bones of the middle toe, and the toe on its fibular side. Still more plantar to this knob, or eminence, the bone is hollowed, in order to lodge the muscles. The distal or anterior aspect has three smooth planes, 1, 2, 3, affording articulation to the three cuneiform bones: *n* indicates a semicircular smooth

surface where it is joined to the os cuboides. The naviculare is entirely cartilaginous in the fetus.

The os cuneiforme internum, *d*, is the largest of the three cuneiform bones: at the point where the letter is placed, the tibialis anticus muscle is inserted; a circumstance deserving the consideration of the operator, as the preservation of this bone would ensure to the patient the flexion of the ankle-joint. By its distal surface, which is semilunar and slightly convex, it is articulated to the proximal extremity of the great toe, 1; by the distal of the two fibular surfaces, to the metatarsal bone marked 2, next the great toe; and by the proximal of these two surfaces to the os cuneiforme medium, e. The cuneiforme internum is cartilaginous in the fetus.

The os cuneiforme medium, e, is the smallest of the three cuneiform bones, and has the most wedge-like shape. Its distal extremity, which is a triangular surface, like the proximal, is articulated to the proximal extremity of the metatarsal bone, 2, next the great toe, and its fibular aspect to the os cuneiforme externum, *f*. This bone is also cartilaginous at birth.

The os cuneiforme externum, *f*, intermediate in size between the other two, is more wedge-shaped than the internum, but less so than the medium. Anteriorly, or distad to its articulation with the medium, is a small smooth surface, 2, articulated to the metatarsal bone, 2, of the toe next the great toe; at 3, by an oblong triangular surface, to the metatarsal bone, 3, of the middle toe; at 4, by a small smooth surface to the metatarsal bone, 4, of the toe next the little one; and at 6, by a square smooth surface to the os cuboides. Between these two last surfaces there is a rough hollow. This bone is likewise cartilaginous at birth.

The os cuboides, *g*, is articulated by a smooth flat surface, slightly divided by a ridge into two planes, with the

metatarsal bones of the little toe, 5, and the next toe, 4; the fibular of these two surfaces is nearly circular. Fibulad and plantad to the surface that supports the little toe, is a considerable fossa, g, made by the peroneus longus in crossing the sole of the foot. In the plantar aspect, proximad to this fossa, the bone is rough and hollow for the attachment of the strong external or fibular plantar ligament. In the fetus ossification has scarcely begun in this bone.

Around the smooth surfaces of the tarsal bones, is a roughness for the attachment of capsular ligaments which envelope each articulation; and, indeed, all the surfaces of these bones, excepting where they are articulated to one another and to other bones, are rough, or porous, for the attachment of strong transverse ligaments. From this attachment, as well as the shape of these bones, we observe, that an elegant and strong arch is formed, and that the multiplicity of articulations thus closely compacted together with the strong plantar ligaments, diffuses an elasticity throughout, but at the same time prevents any free motions. When we consider this structure, we are surprised to learn that any of these bones can be dislocated; the os astragalus, however, is sometimes torn from its connexion with the os naviculare, and the os calcis from the os cuboides; sometimes the astragalus is detached both from the naviculare and os calcis; and sometimes the astragalus and os calcis are detached from the naviculare and cuboides, forming a transverse division of the foot: in other cases the cuneiforme internum is dislocated from its connexion with the great toe, the next toe, and the cuneiforme medium; and in one instance, the metatarsal bones were dislocated from the tarsal. From the variety of these accidents, we see the necessity of making ourselves thoroughly acquainted with the mutual connexion

of these bones; for if reduction be found impracticable, the extirpation of the bone is the next preferable step, to prevent inflammation and its consequences, which have sometimes led to amputation of the foot.

The structure of these bones is similar to that of the bodies of the vertebræ or to the patella, see Plate IV., *Figs.* 7 and 8; so that they are very liable to caries, which, as in the case of the vertebræ, when it attacks one, generally spreads throughout the whole. Extirpation of one or more, or amputation, according as the bones are affected, becomes here also an object of consideration. In injuries of the toes, to the extent of their destruction, amputation across the foot is recommended, between the proximal extremities of the metatarsal bones, and the cuboid and three cuneiform bones; and in injuries which involve these tarsal bones, amputation may be performed between the os cuboides and os naviculare on the one side, and the os calcis and os astragalus on the other.

The five metatarsal bones, 1, 2, 3, 4, 5, more or less resemble one another, and agree in their general characters with the metacarpal bones. They are, however, longer, thicker, and stronger; their bodies are sharper in their dorsal aspects, and flatter laterally, with their plantar ridges more inclined fibulad; their distal or anterior round heads are not so broad, and are less in proportion to their proximal ends or bases; and the tubercles at their heads, are larger in consequence of the ligaments by which they are here united. The first or metatarsal bone, 1, of the great toe, is easily distinguished from the rest by its thickness: the next, marked 2, is the longest, having its plantar edge sharp and almost perpendicular: the others become shorter and more oblique as we proceed fibulad.

The os metatarsi pollicis, as it has nearly the whole weight of the body to sustain, is the thickest and strongest

of these bones; its base, or proximal extremity, *s*, has a corresponding concave surface to be adapted to the os cuneiforme internum, *d*. The plantar aspect of this base is rough, and somewhat prominent for the insertion of the peroneus longus muscle, the long lever of which should be considered in dislocation of the ankle-joint, accompanied with fracture of the fibula. A small oblique circular depression is made on the fibular side by the metatarsal bone, 2, of the next toe. At the distal extremity on the plantar aspect, the round head has generally a middle ridge, and two oblong cavities for sesamoid bones. On the fibular aspect, a small depression is made by the tubercle of the head of the next metatarsal bone.

The metatarsal bones of the second toe, 2, the middle toe, 3, and the fourth toe, 4, I need not minutely describe. They have all at their proximal ends, or bases, surfaces corresponding with the tarsal bones to which they are connected; and the point where they are applied to each other, is at once seen in the drawing. These connexions should be attended to by the operator, in order that he may be able to remove an individual diseased bone.

The os metatarsi minimi digiti is the shortest of the four fibular toes, flattened dorsad and plantad, and having its ridges disposed laterally. The base is very large, and produced into a long process, *t*, to which the peroneus brevis and part of the abductor minimi digiti, are attached.

At their bases, the metatarsal are firmly connected to the tarsal bones, and to each other, by capsular, transverse, dorsal, and plantar ligaments, so that little or no motion is here allowed, and dislocation rarely takes place; and at their heads, they are tied to each other, with nearly equal firmness, by transverse ligaments, so that dislocation as seldom occurs here. The long arch of the foot is formed between these heads, and the protuberance on the

plantar aspect of the os calcis, so that these being our only supporters, are necessarily strong, and limited in their motion.

At birth, these bones are cartilaginous at their extremities, which, like the long bones, become afterwards epiphyses.

The bones of the toes, especially the two of the great toe, are nearly similar to those of the thumb and fingers; they are, however, proportionally much stronger, as they are subjected to a greater exertion by sustaining the force with which our bodies are pushed forwards at every step we take, and by supporting in a great measure the weight of the body when we raise ourselves on our tip-toes. Into the base of the first bone of this great toe the flexor brevis is inserted, and into the second and last bone the flexor longus pollicis; and the tendons of the extensor proprius pollicis, and extensor brevis digitorum pedis, are expanded over the dorsal aspect of these bones.

The three bones in each of the other four toes differ from those of the fingers, in being less in proportion to their lengths; in their bodies being narrower, dorsad than plantad, and their sides flatter; and their bases much smaller than their heads. The first phalanx, 8, 11, 14, 17, is proportionally much longer than the bones of the second phalanx, 9, 12, 15, 18, or those of the third phalanx, 10, 13, 16, 19. The toe next the great toe, has the largest bones, 8, 9, 10, in all dimensions. The little toe, and the one next to it, have frequently the second and third bones, 18, 19, and 15, 16, intimately united into one, which is probably owing to their little motion, and the great pressure to which they are subject. Into the bones of the second phalanx the tendons of the flexor brevis are inserted; and into those of the third phalanx, the tendons of the flexor longus. The bones of

the two first or proximal phalanges have each a delicate lateral ridge giving attachment to the vaginal ligaments of these flexor tendons. Into the dorsal aspect the expanded tendons of the extensor longus and brevis digitorum pedis are inserted.

The bones of the toes are connected at each of their extremities, except the distal of the last phalanx, by capsular and lateral ligaments, so that free motion is performed. The toes are of great use to us in walking, as they bring the body with its centre of gravity perpendicular to the advanced foot. They are sometimes dislocated, and the bone 6, of the great toe, is not unfrequently dislocated from its metatarsal bone 1.

The first bone 6, of the great toe, and the two first phalanges, 8, 11, 14, 17, and 9, 12, 15, 18, are cartilaginous at their extremities in the fetus, and their distal ends or heads are afterwards joined as epiphyses. The distal phalanx, 7, 10, 13, 16, 19, are cartilaginous at birth, and remain epiphyses till maturity, which should be recollected in bruises of the toes. The internal structure of these, and of the metatarsal bones, resembles, in general, that of the long bones; and they are also subject to the same diseases.

The contrast between the upper and lower extremity is striking, for if we assume the os innominatum as the bone corresponding to the scapula, the former admits of no motion. The upper extremity is adapted for mobility and prehension, the lower for strength and progression. Hence the thigh bones where they are articulated to the pelvis, are set off at an obtuse angle, which increases the distance at their proximal ends, while it approximates their distal extremes at the knee-joint. This enables us in walking and running to double the bones on each other at the joints, and proceed without describing a circle either

with the trunk or the leg. In these actions, the centre of gravity is uniformly preserved, with this difference, that in running it is not always supported, but is for a time suspended in the air.

PHYSIOLOGICAL

AND

PATHOLOGICAL OBSERVATIONS.

The bones begin to be formed at a very early period of life. About the third week after conception, the fetus is observable, and towards the end of the fourth, the heart may be seen to move; in the fifth week, the parietes of the thorax are a delicate gelatinous membrane, and in the sixth, the ribs have the appearance of a spider's web. From this period, the ribs, sternum, and clavicles, become cartilaginous,* and in immediate succession the other rudiments of the bones; the flat bones appear simple membranes, and those of the cranium form an extended surface, without the slightest vestige of separation by sutures; and the bones of the extremities have visible articulations,

* Cartilage is the white semi-transparent dense substance which covers the articular surfaces of the bones in the fresh state, or is interposed between them. It forms a stage in the transition to bone, as is established by the growth of the bones in the fetus, and by many of the cartilages becoming ossified in advanced age. A cartilaginous matter exists in the hardest bones, and constitutes their basis, from which the gelatin and phosphate of lime may be removed. This substance is provided with nerves, arteries, veins, and lymphatics, as is satisfactorily proved by its growth in health, its increased sensibility and absorption in disease. In joints, the cartilaginous surface does not secrete any synovial fluid.

but the periosteum extends from the one extremity to the other, enclosing all in a sheath.

Between the seventh and eighth week, points of ossification are seen shooting, like the congelation of water, in different directions in the ribs, sternum, and clavicles; which afterwards spread rapidly throughout the different parts destined to become bone. Nuclei of ossific matter are deposited in the cylindrical bones of the extremities, in the lower jaw-bone, and in some of the other bones of the face and cranium. The bones of the internal ear, however, are found ossified even prior to all the others, that this organ of sense may be of early service to the fetus. In each of the bones of the cranium appears one or more nuclei, named the centres or points of ossification, from which the ossific matter branches around like the radii of a circle, presenting a beautifully feathered appearance, as seen in Plate IV., *Fig.* 6.

In the early stage of the fetus, the dura mater and pericranium form one condensed tunic or membrane, and at the points where ossification begins, the arteries both of the dura mater and pericranium deposit ossific matter; those of the pericranium to a greater extent than those of the dura mater. The experiments of Herissant, and the observations of David, support this opinion; and the diploe which is observable in the adult bone equally confirms it, for we have an osseous lamina or table on each side. The experiments of M'Donald prove that the internal periosteum of the long bones is concerned in their reproduction in necrosis; and considering that the vessels of the medulla pass ultimately outwards through the bone, this opinion seems perfectly consistent. It is also supported by other pathological facts besides necrosis.*

* See Cases recorded by Duvernay, Quesnay, Mareschal, Rouhault, Sarran, Fabre, and Raygerius.

The long bones, as soon as they can be discerned, although purely gelatinous, have a cylindrical figure, and when converted into cartilage, their diaphyses or shafts can be distinguished from their epiphyses or extremities, by the interposition of a gelatinous bed; they are also seen invested with a membrane. Rings of bony matter begin to appear in the middle of the shaft, spreading upwards and downwards to the extremities of the bone; blood-vessels then enter the structure of the bone; and within the osseous shell now formed, numerous short vascular villous tubes extend longitudinally, and terminate in delicate villi at the gelatinous stratum interposed between the shaft and epiphyses; some, however, penetrate this stratum, enter the cartilaginous extremities, and terminate in irregular cavities filled with a mucilaginous fluid. Around these longitudinal villous tubes, which are extremely small, ossific matter is deposited, so as to give the bone some consistence; and the tubes, which are arranged in layers, communicate with each other through the medium of other shorter villous tubes.

The external periosteum can now be distinctly seen, and soon afterwards the internal periosteum. The osseous cancelli, which support the medullary pouches, are next formed; the pouches themselves being produced by the internal periosteum shooting across thin membranous septa which unite with others from all sides of the canal, forming so many distinct bags. The medulla, however, does not begin to be secreted till after birth.*

* The medulla or marrow which is secreted by the arteries, appears in the fetus and in infancy like a deep red jelly, in consequence of the great number of blood-vessels interspersed. As life advances, it obtains more consistency; the blood-vessels decrease in number, and it assumes a yellow colour. In old age it becomes of a deep yellow colour, and of a thicker consistence. In the tubular portion or shaft of the long cylindrical bones, it has more consistence, and a deeper yellow colour than in the cellular spongy extremities of the same bones, where it

The bone has now acquired a perfect shape, consisting of a cylindrical tube with epiphyses, and has generally a

is redder and more fluid; which is equally the case, if not more so, in the flat and irregular round bones. The most solid portions of bone are found penetrated with the medullary fluid. When enclosed in the pouches of the internal periosteum, and examined by the microscope, the medulla appears like an accumulation of globules, each of which is about the sixth or eighth hundredth part of an inch in diameter. This fluid is not tinged by madder taken internally. The constituent principles of marrow are found to be the same as other fat substances, viz. oil, water, and sebacic acid. According to Isenflamm, its specific gravity is greater than that of water, while according to Plenk and Soemmering, it is less.

Marrow is more solid and yellow in the male than in the female animal, and it is also in greater quantity in the former than in the latter. The use of the medulla has been long a matter of discussion. Hippocrates and Galen were of opinion, that it served for the nutrition of the bones; Havers and many others, that it served for lubricating the joints; Bertin, Haller, and Blumenbach, that it renders the bones flexible, and gives them strength and elasticity; Soemmering, that it was intended only to fill the vacuum in bones. It has been imagined by some physiologists to contribute to the formation and growth of the bones; while others think it of great service in producing callus and restoring the bone to its former strength. Isenflamm conceives, that it is intended for different purposes, according to the age of the animal; that in children it may perhaps contribute to nutrition, so that the bones may be considered materia nutritiva; and that in old people it may confine the heat internally. He also considers that the medulla may bind electric matter. Of all these opinions, that of Bertin, Haller, and Blumenbach, appears the most rational, with this modification, that the medulla contributes little or nothing either to flexibility or elasticity, for the bones of children in which the marrow is not yet perfectly formed, are much more flexible and elastic. The experiment of Bertin, wherein he deprived bones of their marrow by fire, thus rendering them brittle, and then immersed them in oil, thus restoring their flexibility, frequently failed. The medulla therefore appears to be intended to moisten the bones, and thus to give them strength. With the exception of the epidermis and its appendages, no part of the body is destitute of moisture, and as water or mucous could not have been in advanced life so easily and readily deposited and absorbed in the bones, the vessels of which at this period are nearly obliterated, the medullary fluid seems admirably adapted for this purpose.

In consumptive diseases, the medulla is absorbed by the lymphatics, but soon deposited, if these disorders are cured. It does not appear to be subject to idiopathic diseases, but is only changed when the bones are affected at the same time. Boon found it spongy and fibrous in the callus of fractured bones; Navier, like fluid fat in mollities ossium; and Troja observed it became white, solid, and beginning to ossify in the upper part of a fractured bone.

peculiar foramen that gives entrance to a principal nerve, artery, and vein. It then gradually advances in growth according to the stature of the individual; the shaft acquires rings of osseous matter which constitute a sheath to the bone already formed, and consequently extend from the one extremity or epiphysis to the other, in a similar manner to the annual rings or layers of the trunk of a plant; while the cartilaginous epiphyses are progressively converted into bone, and unite firmly with the shaft. Thus, each external layer of ossific matter extends at the epiphyses beyond the internal one, forces the epiphyses further from the shaft of the bone, and hence lengthens the bone to correspond with the growth of the other organs of the body. The layer of gelatinous matter interposed between the shaft and the epiphyses facilitates this progression.

The formation of the annual ring of wood in trees through the medium of the bark, and the growth in height by the prolongation of the annual shoot, beautifully and clearly illustrate the mode in which the long bones are formed. These facts of vegetable physiology are satisfactorily established by the experiments of Du Hamel, Hope, and Knight: for, in physiological inquiries, we are entitled to draw analogies from vegetable anatomy and physiology; however, from comparative anatomy and physiology, we have the most unequivocal proof that this is the manner in which the long bones are formed.*

The experiments of Du Hamel, Blumenbach, Kœhler, Troja, and M'Donald, and the observations of Lewenhoeck, Morand, Belchier, Monro *primus*, Richter, and David, all corroborate the fact, that bone is formed chiefly

* Consult Experiments of Du Hamel and John Hunter.

by the periosteum. David differs a little from the others, conceiving that the augmentation of the diameter of a bone is as much the production of the interior texture of the already solid part, as of the external periosteum. He denies the existence of an internal periosteum.

The formation of the teeth, by the vessels of a membranous bag, is an illustration of the formation of the bones;* so is the formation of the cuticle, the nails, and

* In the fetus, about the tenth week after conception, there is no vestige either of an alveolar socket or nucleus of the teeth, but simply a gelatinous substance included in a very vascular membrane extended around the maxillary bones.

About the fourth or fifth month after conception, the lower jaw-bone has a distinct shallow groove extending through its whole length; anteriorly this is narrower and deeper, and posteriorly wider and more shallow; and in this canal appear little pulps, enclosed in delicate membranaceous sacs, surrounded with small cells of a rude form. These bags are the rudiments of the teeth to be produced. Nearly about this period, delicate bony partitions, separating these membranaceous pouches, are seen extending across this canal; which ultimately become more distinct, and form the alveolar sockets.

The sacs of the incisivi are first visible; next those of the canini; and, lastly, those of the molares.

The nerves and blood-vessels run along the bottom of this channel immediately beneath the pulps of the teeth; and at a more advanced age are encased in a bony canal, and send separate branches or filaments to the individual teeth.

The pulps attached to the bottom of the cells gradually assume the figure of the crowns of the respective teeth which they are to form, and then begin to be converted into bone. In the incisivi and canini, the vessels of the membranous bags commence with depositing ossific matter externally at their tips or points; the ossification then extends downwards, both on their exterior and interior surfaces, and also from without inwards, pressing the pulp gradually downwards. As soon as the crown of the tooth is formed, which is named enamel, the fang or root is produced of a hollow tubular form to afford lodgment for the vessels.

In the molares ossification begins at two points in the first two or bicuspides, which are the milk or deciduous grinders; and at five points in the last three molares or permanent grinders. In the molares, the strie run on the upper surface from each of these tips to the centre, and from the same points downwards to the neck of the tooth; ossification extends at the same time centrad, squeezing down the pulp, leaving a cavity, and producing the fangs in the same manner as the incisive or canine teeth did.

the hair, which are all secreted by organs distinct from themselves. It is only in the fetus, and while the bones

This process resembles the beautiful appearance displayed by the slow congelation of water, or the elegant surface of fibrous gypsum, or satin spar.

The ten teeth which are now formed, for we must exclude the three last molares, are termed milk, or deciduous teeth, because they fall out, or are shed at a future period of life; they are also denominated temporary. We must here also recollect, that at this time the roots or fangs of these deciduous teeth are not yet formed; for they do not begin to be produced till after birth.

About the seventh month after conception, the pulps of the permanent incisores are seen almost in the same plane, only a little underneath the deciduous set, and next the canini; and, lastly, the molares. At birth, therefore, a child has the rudiments of both the deciduous and permanent teeth lodged in the jaw-bone, and covered with the gum and lining membrane of the mouth. The crowns of the deciduous teeth alone are ossified.

After the child is born, the roots or fangs of the teeth begin to be produced, so as to render them too long to be contained within the alveolar socket, and hence to raise the crowns gradually towards the gum, which, giving less resistance than the alveolar socket, is cut more by mechanical pressure than by absorption. It is this mechanical puncturing, or cutting of the gum, which produces the severe symptoms and diseases of dentition.

At the age of the sixth or seventh month, the middle or mesial pair of the incisivi of the lower jaw protrude through the gum. In a few weeks the opposite pair of incisive teeth in the upper jaw also make their way through the gum. In a few weeks after the appearance of the two last, the two lateral incisores of the lower jaw force their way through the gum; but sometimes the corresponding ones of the upper jaw pierce first. This is the natural and general order in which the incisive teeth appear in the mouth; but I find this order inverted by Richerand, while Albinus, Haller, Hunter, Soemmering, Bichat, and others adopt it. Richerand, I should presume, has either adopted this order from an individual case in nature, or he has followed Eustachius and some of the ancient authorities. The reason, that the teeth in the lower jaw come sooner to perfection, appears to arise from the lower jaw being a more dense bone than the upper, and the vessels possessing the power of more easily and more readily secreting bone: from which cause the vessels of the lower jaw can secrete a new bone when the old is dead, while those of the upper cannot.

Towards the end of the first year, the two first molares, or bicuspides of either the lower or upper jaw are visible; generally those of the lower jaw first.

During the second year, the canine teeth are pushed forth, and towards the end of the same year, the two second or remaining bicuspides make their appearance.

possess a delicate texture, that they are secreted by vessels which perforate them minutely. The regeneration of

We have, therefore, the whole of the deciduous set, namely, twenty in number, present in the beginning of the third year.

These are the general periods of time in which these teeth make their appearance in the mouth; but they are frequently varied. Sometimes, the first tooth appears so early as the fourth month; nay, instances have occurred of children being born with one or two of the incisive teeth of the lower jaw. Pliny and Solinus relate that some were born with all their teeth. Other children have arrived at the age of fourteen months before the appearance of any teeth. It is recorded that Pheretes never possessed a tooth in his life. Again, sometimes the teeth of the upper jaw appear before those of the lower; sometimes the lateral incisivi before the medial; and in a few instances, the first molaris before the lateral incisores;—while occasionally more teeth appear at the same time than are naturally to be expected.

The pulps of the permanent teeth begin to ossify about the sixth month after birth, and continue advancing to perfection till the seventh year, when the fangs of the deciduous teeth, and the alveolar floor which divided these from the permanent, are absorbed; and the deciduous teeth, having no longer any attachment, fall out. The permanent then make their appearance above the gum in an order similar to the deciduous teeth. The formation and perfection of this set of teeth occupy from twenty to thirty years. The permanent, incisive, and canine teeth are larger than the deciduous, that they may correspond to the increase of the jaw-bones. The molares which supplant the deciduous ones are smaller in size, that they may make room for the three which are to appear behind them. By the twelfth year all the deciduous teeth have generally fallen out and been supplanted by the permanent. The anterior of the three backmost molares usually makes its appearance between the seventh and eighth year: the next or the fourth from the canine is ossified about the seventh year, and pushed forth about the eighteenth year: and the last or fifth from the canine appears between the eighteenth and thirtieth year, and sometimes even later.

The natural history of the teeth points out to us the manner of their formation and protrusion through the gums; the latter of which gives rise to many important diseases, which frequently involve the welfare of our offspring. As it is the regular arrangement of the teeth which enables the individual to articulate with distinctness; as they perform very interesting and useful functions which cannot be interrupted without our sustaining the greatest inconvenience; and, lastly, as they involve the contiguous structures in various diseases,—it seems truly surprising, that their natural history, as well as their diseases, are not more diligently cultivated.

the horns of the stag admirably illustrates the formation of bone. The regeneration of the bone in necrosis is another excellent illustration, and although drawn from disease is perfectly admissible, when it is but one fact selected to elucidate several healthy phenomena.*

In this manner are all the bones formed, which formation is completed about puberty. The elevations, depressions, and foramina, are produced by the muscles and vessels attached to them, or which pass over or through them.

In the fetus, the bones are quite gelatinous, in order that it may be moulded into the shape most convenient for its abode in utero; and even in the latter period of its residence, the greater number of the bones remain cartilaginous, that it may sustain no injury in its entrance into the world. In infancy, and in early life, the bones have a bluer colour than in manhood, in consequence of the greater distribution of blood-vessels, and their not being completely ossified. At this period, the animal property predominates, and therefore they are more yielding and less liable to break. When fractured, they more readily unite, and when inflamed, they are more easily cured. The spongy bones when attacked with inflammation, are less liable to become carious, and the dense compact bones are more easily necrosed. The epiphyses of the long bones are occasionally displaced, an accident sometimes mistaken for fracture.

In youth, the animal and earthy properties exist nearly in equal quantities, but the epiphyses are still unconnected by ossific matter to the shafts or diaphyses; and they have still a blue tinge though not so deep, and when attacked

* Consult Cases detailed by Pouteau and Gooch.

with disease differ very little from what occurs in the preceding stage of life.

In adult age, the earthy portion, or phosphate of lime, preponderates, and the bones assume a whiter colour, although the long ones still possess a bluish tinge at their extremities; they are more brittle, and, when fractured, unite more slowly; they are also less easily inflamed, but when they have assumed this morbid action, it is with greater difficulty subdued; and they readily exfoliate, or become carious, but are tardy in being necrosed.

As life gradually declines, the earthy constituent increases, and displaces the animal, till the bones become extremely brittle; the power of cohesion leaves them, and they appear to be preparing to moulder away into that state from which they sprung. When this loss of union occurs, the heads of the bones, particularly those of the thigh, separate from the shaft; and like that in early life, this has been mistaken for fracture or dislocation. The reason of this separation of the head of the bone from the shaft, appears to be, that the nutritive deposition has ceased, while the absorbent action continues, and that the bond of union between the head and neck of the bone, gelatinous in early life, and cartilaginous nearly till puberty, is later in becoming ossified, and consequently weaker, and more easily and quickly removed by absorption. When fractured in advanced life, the bones unite, if at all, with difficulty; they are slowly inflamed, with equal slowness cured, and readily degenerate into caries, but are with difficulty necrosed.

In health the bones are endowed with little sensibility; but that they possess feeling is proved by the various experiments, particularly of Troja, which have been performed on animals; and by what is daily witnessed in

the amputation of a sound limb. It can be demonstrated that they have nerves; and although these pass through foramina, yet the aperture remains as pervious as the foramen opticum, and other holes in the basis of the cranium. Were they not supplied with nervous influence, they could not possess vitality, as no part of the body destitute of this property can be said to live, and no part which possesses vitality is destitute of sensibility. Again, they are supplied with arteries, which also prove the presence of nerves, as no artery exists without nervous influence. This sensation they possess in the greatest degree in infancy and youth, before the ossific process is completed; but, as they become gradually solid, they lose their sensibility and vascularity, the vessels throughout the general structure of the bones being nearly obliterated; still, however, the nutritious artery, with its accompanying nerve and vein, is allowed free ingress to the internal periosteum and medullary pouches, till the last period of life: were this not the case, necrosis would be an inevitable consequence. The sensibility of the bones is greatly increased when inflammation attacks them, which is a collateral proof of their sensibility in health; and the pain in this disease is generally excruciating, apparently in consequence of their structure not yielding. Did the bones not possess nerves, they would be dead matter like the epidermis, the nails, the hair, and the enamel of the teeth; undergoing no change during health, and suffering no derangement from disease. On the contrary, when we consider that they possess nerves and consequently sensibility, blood-vessels and consequently vascularity, we understand that they are parts of the living system, subject to the same changes and diseases as the other organs of the living body.

The vascularity of the bones is satisfactorily shown when a young bone is injected, or when a young animal is fed on madder, for the bones then become tinged of a bright red colour. The blood-vessels can be distinctly seen in a fetal bone, and even in that of an adult. When a bone is injected, and then deprived of its earthy matter by diluted muriatic acid, the blood-vessels are seen to be very numerous. The existence of blood-vessels is also proved in amputation and other surgical operations, in which the cut ends of the bone are observed to bleed. Now, as every artery must be endowed with nervous substance, the presence of arteries in bone proves the existence of sensibility. The blood-vessels are designed for growth and nourishment.

To be satisfied that the bones possess absorbents, we have only to consider the continual regeneration which goes on throughout the system; but we have demonstrative evidence of the fact in the experiments of Du Hamel and others. Young animals were fed on madder for a few days, and then some of them killed, when the bones were found to be tinged of a deep red colour. Those left alive were allowed to range the fields, and live on their natural food for some time longer, and then killed: in these the bones had recovered their natural colour. The hypothesis of this circumstance is, that phosphate of lime is an excellent mordant to the colouring matter of madder. If to a solution of muriate of lime a solution of madder be added, no effect is produced; but when phosphate of soda is added, there is a mutual decomposition, and muriate of soda and phosphate of lime are formed. The phosphate of lime unites with the madder during its formation, and is precipitated of a red colour. This holds out a prospect of curing rickets and mollities ossium; but our ignorance of the operations of medicines renders it doubtful how far,

after the administration of phosphate of lime and madder, calcarious depositions might not take place, not only in the bones, but all over the system.

The observations of Monro *primus*, and John Hunter, establish that there is a modelling action of the nutrient and absorbent vessels in the bones; the nutrient vessels, which are the arteries modified in the periosteum and influenced by the nerves, are perpetually secreting osseous matter from the commencement of ossification till its completion, while the absorbents are removing chiefly the inner particles so as to proportion the bone to its growth. In some diseases, such as necrosis and mollities ossium, which attack the bones, the existence of absorbents is also proved.

From all that has been stated, we are entitled to conclude, that the bones in their early stage are formed by the arteries influenced by the nerves, and modified partly by the periosteum, and partly by their elaboration through the gelatinous and cartilaginous substances; and that, as they advance gradually towards completion, the vessels which enter their structure are obliterated, the bones becoming more and more dependent on the periosteum for osseous nutrition.

The bones of the skeleton are divided into three classes; the irregularly round-figured bones, the flat bones, and the long cylindrical bones.

The first class, or those of a round shape, comprehends the true vertebræ, the bones of the carpus, and the bones of the tarsus, which consist of a spongy structure encased in a thin osseous shell. In this description of their structure are included the extremities of all the long cylindrical bones, which have equally a cancellated texture enveloped in a bony shell. When fractured, these bones

seldom if ever unite by osseous junction, but generally by cartilaginous or ligamentous union, or by both; and of this the patella is a good example.* The reason of this peculiarity seems to be, that no part or organ of the body is regenerated so perfectly as at first. The skin, when a portion of it is removed, does not repair itself in so perfect a manner as it formerly existed; neither does the cellular, the muscular, the arterial, the venous, or the nervous substance; and all of these structures are regenerated in the inverse ratio of their perfection. Hence the dense bones, when fractured, form a strong bond of union, and exude a superabundance of osseous juice, without any regard to proportion or symmetry, precisely similar to the exudation of the juice in the engraftment of trees.†

In consequence of their structure, the fracture of these spongy bones is transverse, in which they resemble soft wood, and soft minerals, as lime or marle. When inflammation attacks them, it terminates either in resolution or caries. From their structure they cannot exfoliate; neither can their vessels form an osseous shell so as to constitute necrosis. They are particularly liable to caries, in which circumstance they bear a close analogy to the soft parts. Caries is ulceration of the bones, and this ulceration is found to vary or to present different types, in precisely the same manner as the soft parts; thus we have, analogous to what is improperly styled healthy ulcer, healthy caries; analogous to indolent ulcer, indolent

* In confirmation of this manner of reparation, consult Sir Astley Cooper's valuable work on dislocations and fractures of the joints, and Dr. Colles' important paper in the Dublin Hospital Reports.

† There are two able essays on this subject by Messrs Fabre and Louis, in the Memoires de l'Academie Royale de Chirurgie.

caries; to scrofulous ulcer, scrofulous caries; to syphilitic ulcer, syphilitic caries, &c.

The reason why these bones, when inflamed, so readily terminate in caries, appears to be, that as parts soft and loose in their texture, like the cellular substance, when attacked with inflammation, terminate generally in suppuration, while hard and firm structures, as tendon and skin, end generally in mortification; so the soft spongy bones degenerate into caries, while the hard and dense bones end in necrosis. A part, in order to enter into the suppurative process, or more correctly speaking, to form a surface capable of secreting purulent matter, must apparently enjoy a degree of latitude, to enable the capillary vessels to form secreting papillæ.

When caries attacks the body of one of the vertebræ, or one of the bones of the carpus or tarsus, it rarely ceases before it involves many of the contiguous ones.

From what has been stated, the treatment of caries will vary according to the condition of the ulceration. When healthy, it will require simple dressing, with adequate support by bandage or machinery, according to the nature of the part affected; when indolent, it will need stimulating dressing, and bandage; when irritable, anodyne fomentations, and poultices; when syphilitic, mercurial dressings, either stimulating or soothing, according to its appearance, along with the bold administration of mercury, or gold, when the sore will admit of it, and generous diet. In every case, particularly the scrofulous, the diet must depend on the condition of the ulceration.*

When inflammation is not present, and there is no chance of saving the bone by the preceding treatment, or

* On Caries of all the Bones, see Petit, Gooch, and Histoire Naturelle du Roi.

if a joint, by anchylosis, the removal of the bone, or amputation, becomes a consideration for the surgeon.

The second class of bones is the long cylindrical, as those of the arm and fore-arm, and those of the thigh and leg. They consist of a long tube of dense ossific matter, which terminates in enlarged spongy extremities, see Plate IV., *Fig.* 10; and within the tubular part, and the delicate cancellated structure, the medulla is contained: but it is the consideration of the dense portion, or the diaphysis or shaft only of the bone, that is to engage us at present, as the extremes or epiphyses are strictly analogous in their structure and diseases to the last-mentioned bones.

The bodies or shafts of these bones, when fractured, are most quickly united, because their vessels are more endowed with the property of secreting ossific matter, and this according to their multiplied distribution; therefore, we find them more quickly united in early life, more slowly in adult life, and still more slowly, if at all, in advanced life. The callus or bond of union, which is a gelatinous secretion, performed chiefly by the vessels of the periosteum, and also by those of the truncated points of the bone, does not take place for some time after the fracture, and this sooner or later according to the youth of the sufferer, and according to the duration of the inflammation which supervenes on the accident: again, as no secretion can take place during inflammatory action, as the periosteum is always inflamed, and as the fracture of these bones is oblique and splintery, in which they resemble hard wood, and hard compact minerals, and as the muscles, from the injury they sustain, are in general always excited, it appears fruitless to attempt the setting of the limb, till both the inflammation and irritation of the muscles have subsided. Independently of these reasons, the callus re-

mains gelatinous for some days, which is clearly established by experiments.*

The most successful practice is, to attend first to the inflammation, and when it has subsided, to place the limb in a straight position; I have seen even twelve days elapse before the limb was set, and the callus still soft. Whenever the accident occurs, the fractured limb should be laid in the easiest position for the feelings of the patient, and warm anodyne fomentations and poultices applied, and continued till pain and inflammation subside. At this crisis, let the limb be extended and supported with pillows, and let it be examined daily, and daily extended if found requisite. "There is nothing more certain," says Mr. John Bell, "than that the extending a callus gradually, regularly, and gently, from time to time, will not harm it." This practice will invariably prevent the shortening of the limb.† The only exception to this line of practice, is that requisite to be adopted in a fractured rib, where the action of the lungs is incapable of being controlled, and where, to prevent their injury, we are compelled to bring the fractured ends of the rib as nearly as possible in apposition, and to apply a broad roller around the thorax to prevent motion. The lancet must be freely used in this accident to subdue inflammation. Many conditions of the body, as pregnancy, syphilis, and scurvy, prevent the union of fractured bones. These appear to act by

* The experiments of Du Hamel show that bandaging a fractured limb increases the evil. See also Pott's Works, and John Bell's Principles of Surgery.

† I have more than once had occasion to amputate fractured limbs that had been imprudently bandaged by others on receipt of the injury, thus exciting inflammation and suppuration, or mortification. I was called the other day to remove a limb, the tibia and fibula of which were at first only simply fractured, but by this improper treatment of bandaging, were rendered compound fractures, involving the ankle-joint in the ulceration to a great extent.

the increased action, and particularly by increased absorption, which prevent the same nutritive deposition taking place in the bones as in the other textures.

The long bones gradually decrease in density from the centre to the extremes, until they consist of a cancellated structure with a delicate osseous shell, see Plate IV., *Fig.* 10, so that the fracture becomes less and less oblique till it arrives at a transverse direction. The bond of union departs in the same ratio from bone to cartilage and ligament. Hence the fracture of the neck of the os femoris is transverse, and there is no union by ossific matter like the centre of the shaft, but only by ligamento-cartilaginous bands, and sometimes osseous spiculæ; indeed from the structure we can expect nothing more.*

When inflammation attacks the shafts of these long bones, the disease terminates either in resolution or exfoliation, which is analogous to desquamation of the soft parts, or in necrosis analogous to sphacelus of the soft parts. If the hypothesis I have advanced relative to caries be correct, it follows, that dense compact bones cannot ulcerate, because there is not room for their vessels to form ulcerative papillæ; again, as inflammation cannot exist without some degree of swelling, and as the shafts of the long bones are so dense and unyielding, that the vessels have no latitude for enlargement adequate to the increased impetus of the blood, they die; and the bone being thus deprived of nourishment, immediately shares the same fate. When the shaft of the bone thus mortifies, a separation takes place between it and the extremities; the periosteum inflames; an accumulation of vessels with thickening of this membrane ensues; and if the in-

* See Sabatier, Boehmer, John Bell, Gooch, Sir Astley Cooper, and Dr. Colles.

flammation be moderate or towards its subsidence, the vessels, together with those of the epiphyses and of the internal periosteum, if this membrane remains sound and healthy, begin to secrete a greater quantity of ossific matter to replace the decayed portion. But from what has been stated, the vessels of the epiphyses had not originally the property of secreting dense bone, and cannot therefore be expected to secrete it now. The internal periosteum is nourished from without, and as there is an intimate connexion between it and the external periosteum, its vessels are frequently cut off, and consequently can seldom have any concern in the secretion of a new bone. Nature then seems to trust chiefly to the external periosteum, and, happily for us, this membrane appears adequate to the task. After the secretion of the new bone has extended from the one epiphysis to the other, the periosteum loses its injected appearance, and returns to its natural colour and density. The new shell, hitherto incorporated with the old bone, separates, and an internal periosteum begins to be formed; and if the old bone could be extracted at the one extremity to prevent the effusion of the new secretion, the medulla would be in a short while deposited, and the new bone perfected. But the old bone frequently forces its way through the centre of the new shell during the secretion of the gelatinous effusion, which therefore runs into the cavity, and makes the new bone solid for a time; for absorption takes place after the expulsion of the old, so as to enable the new bone to be completed.

This modus operandi is supported by the experiments of M'Donald, and by a well marked case detailed by Pouteau, as well as by several cases which have occurred in my own practice.

Necrosis occurs chiefly in early life, and attacks the tibia more frequently than any other bone, as is proved by the cases recorded by Bousselin, Russel, and others. When it attacks the inferior maxillary bone, it is generally after thirty years of age.*

From the cases on record, as well as from those which I have witnessed, I am of opinion that the dead bone should be left as long as the health of the patient will permit. The danger of removing it consists in the injury thereby done to the periosteum, and the consequent deficiency of new bone. When allowed to remain, it generally proves a mild source of irritation. For the same reasons, all extraneous bodies, as musket bullets when lodged in the dense portions of the long bones, should be suffered to remain, unless they become sources of irritation; but when they are lodged in the epiphyses, as they produce there frequently very extensive ulceration, they ought to be removed.

Necrosis is sometimes produced by the death of the internal periosteum and medulla, as is proved by the experiments of Troja.

* It sometimes attacks the scapula, a case of which I saw in Leith a few years ago. Chopart takes notice of a similar affection of this bone. A case is mentioned by M'Donald, wherein nearly all the bones of the body were affected with necrosis. A well marked case of necrosis of the inferior maxillary bone, is related by Guernsey, where only the condyloid process of the old bone remained on the one side, and on the other, the ramus and side onwards to the second dens molaris. In this instance the new bone could scarcely have been secreted by the old. Walker of America mentions a case of necrosis of the inferior maxillary bone, where both rami and sides came away, leaving only the body or mental portion. Beinr details a case where the inferior maxillary bone was so destroyed by the wheel of a mill, that it could not be saved, and yet was regenerated; Belmain, a case where two-thirds came away; Raygerus, a case of an old woman, eighty years of age, from whom the entire half of the inferior maxillary bone desquamated, without regenerating; and D'Angerville, a case of clavicle necrosed. Ruysch seems to have been the first who took notice of this disease; then Meckren, Sculletus, David, Chopart, &c.

Although I have stated that the dense bones terminate in necrosis, yet I do not mean to contend that they never end in caries. This latter disease, however, occurs only in early life when the bones are soft, or in scrofula, scurvy, &c.; or when their spongy extremities are attacked. They must first become swollen, as in spina ventosa, so as to permit the ulcerative papillæ to be formed.

The third class is the flat bones, as those of the cranium, the structure and fracture of which, as well as their diseases, have been described in page 46.

Many cases of caries of the bones of the skull are detailed by Mr. Louis.

Exostosis, which is a tumour consisting of a diseased secretion of bony matter, with sometimes a thickening of the periosteum, or a tumour that consists only of a diseased thickening of the periosteum, frequently attacks the bones of the cranium; although all bones of any density, and thinly covered with muscular substance, are as liable to this disease as the inferior maxillary bone, sternum, clavicle, ulna, and tibia. Of the bones of the cranium, the os frontis seems most susceptible. Exostosis depends almost invariably on a constitutional affection, which is generally syphilis. The corrosive muriate of mercury, or the chloride of mercury, and the muriate of gold, have a peculiar efficacy in mitigating the pain in this syphilitic tumor, even after the system is saturated with mercury through the medium of the pill and ointment. The manner in which muriate of mercury may act in discussing syphilitic exostosis, appears, first as a stimulus, secondly, as affording oxygen, and thirdly, by the muriatic acid entering into union with part of the lime of the bone, thus breaking the bond of cohesion and permitting absorption to take place. This, so far as analogy goes, is

supported by Madame Supiot's case of mollities ossium, and by scurvy, the ancient scourge of our fleets. Both of these diseases can be traced to the eating of muriate of soda. In scurvy, the bones lose their cohesion, the epiphyses separate from the shafts, fractured bones disunite, and the alveolar processes are quickly absorbed. Of this chemistry affords a satisfactory explanation; and were solids and fluids taken up unchanged by the lacteals, we should be able to cure many diseases, and give rational theories of the operation of medicines.* Petit observes, that exostosis seldom attacks the constitution in this disease.

Spina ventosa appears an aggravated species of exostosis where caries follows with suppuration within the canal of the bone. The disease commences in the centre of the bony matter, and is consequent on inflammation; and attacks all the bones, particularly the lower jaw bone, † and even the extremities of the long bones. Numerous cases are on record of this species of exostosis, the most remarkable of which are detailed by Saviard, Trippin, Bordmave, Morand, Mery, Houstet, and David.

Mollities ossium, or osteo-sarcosis, named also malacosteon, is that disease wherein the bones become so soft, that they may be twisted or bent in any direction, and in which, being deprived of their earthy property, as if they had been macerated in diluted muriatic acid, their animal constituent only remains. Of this disease, there are a few well marked examples, viz. Madame Supiot, Mary

* The preparations of gold were used as early as the sixteenth century by Lecocq, afterwards by Hoffman and others, and latterly by M. Chrestien of Montpelier.

† The greater portion of the lower jaw bone has been successfully removed by Dupuytren and Lallemand, a line of practice evidently preferable to that of trephining and chiseling. The former at once removes the whole diseased portion, while the latter almost invariably leaves the roots of the disease.

Hayes, Mrs. Forster, and James Stevenson. Both Madame Supiot and Mrs. Forster used a great deal of salt in their food. Stevenson's affection depended on a syphilitic taint. Cases are also related by Gagliardi and Morand. MacBride considers a prevalent acid in the system as the source of this disease, and recommends a course of lime water, and other antacids.

Rachitis may be considered a species or variety of mollities ossium. It attacks chiefly children, in consequence of the bones having more of the animal than the earthy principle; distorts principally the spinal column and ribs; and is generally combined with scrofula. The treatment of this disease consists more in diet and regimen than physic. The child requires to be supported with machinery, and should remain the greater portion of both day and night in the horizontal posture; its diet should be generous, but in no degree stimulating. This treatment, accompanied with gentle exercise, or exposure in the open air, cold bathing, and the use of the flesh brush, will do more to remove the disposition which exists in this malady, than all the medicines in the laboratory. Of all the preparations of lime, the phosphate promises most relief; and if madder were given in combination, or administered before or after it, the phosphate would prove a valuable remedy, provided we could prevent earthy depositions taking place in any other parts than in the bones. The experiments of Du Hamel might satisfy us of the safety of this treatment; for he observes, that in them, the skin, the brain, the nerves, the muscles, the cartilages, the membranes, remained perfectly natural; and that only the long osseous tendons which are hard in the middle, and all the true bones, or the most dense bones of birds, were coloured like carmine. I have administered the phosphate by itself, but I cannot say that there was any quicker

amendment than when diet and regimen alone were employed. I have exhibited the muriate of lime like an empiric, but never observed any beneficial result; and if it ever effect a cure, it must be on the principle that the muriatic acid combines with any soda existing in the bones, while the phosphoric acid attracts the lime. Soda is said by Berzelius to be present in bones. Carbonate of iron as a tonic, seems a good remedy.

Fragilitas ossium is a disease which may be considered the opposite of mollities, depending on a superabundance of the earthy constituent, and hence attacking people in advanced life. When the bones are broken in the disease, they unite with difficulty.*

Fragility occurs in the syphilitic, scorbutic, arthritic, scrofulous, and rachitic constitutions.

Anchylosis is the union of the extremities of the bones which compose a joint, and which have been rendered carious by inflammation; and in this case is a result to be wished for by the surgeon, when he has failed to subdue the inflammation of the joint.† This disease, however,

* Saviard describes a case of this disease, which occurred to a woman only thirty years of age; all the bones broke to pieces in such a manner, that it was impossible to touch her without causing a fresh fracture; and in this condition she lived for six months. On dissection, the vertebræ, ribs, clavicles, bones of the arms, pelvis, thighs, and legs were shattered and bruised: not one bone was without a fracture. Those of the cranium gave way under the fingers, like those of a fetus fifteen days old. No cause could be assigned for this singular disease;—there was no constitutional affection whatever.

† Anchylosis is accomplished by subduing the activity of the inflammation by warm anodyne fomentations and poultices; and then by applying the actual or potential cautery repeatedly, healing the ulcerated surfaces as quickly as possible, and keeping the limb in a quiescent state in a fracture box, and confining the patient to bed. In this way I have recently succeeded in saving a limb that was deemed to be amputated.

has occurred without any marked increased action, as in the instance of Clark, detailed in the forty-first volume of the Philosophical Transactions, where all the bones, from the crown of the head, to the sole of the foot, were completely soldered together.

ERRATUM.

In page 6, line 15 from top, for italic *n*, read italic *k*.

INDEX

TO

THE LETTERS OF REFERENCE

IN

PART I.—THE BONES.

PLATE I.

a, Bones of trunk
b, Bones of head
c, Bones of upper extremity
d, Bones of lower extremity

PLATE II. *Fig.* 1.

a, True vertebræ
b, Foramina common to vertebræ, which transmit spinal nerves
c, Ribs
d, Cartilages
e, Sternum
f, Foramina in transverse processes of cervical vertebræ
g, Os sacrum
h, Ossa innominata
k, Scapula
o, Intervertebral cartilage
p, Clavicle

1, 1, Surface of attachment of trapezius muscle
2, 2, Attachment of sterno-cleido-mastoideus muscle
3, 3, Attachment of greater pectoral muscle
4, 4, Attachment of deltoid muscle

Fig. 2.—A Lumbar Vertebra.

a, Body
b, Ring
c, Articular processes
d, Transverse process
e, Spinous process

Fig. 3.—A Cervical Vertebra.

a, Body
b, Ring
c, Articular processes
d, Transverse processes
e, Spinous process
f, Foramina for vertebral arteries and veins

Fig. 4.—A Dorsal Vertebra.

a, Body
b, Ring
c, Articular processes
d, Transverse processes
e, Spinous process
g, Depressions for articulation with heads of the ribs
h, Depression for articulation with tubercle of rib

Fig. 5.—Atlas.

a, Body
b, Ring
c, Articular processes
d, Transverse processes
e, Spinous process
f, Foramina for vertebral arteries and veins
i, Indicating attachments of transverse ligament
k, Smooth surface on which processus dentatus revolves
m, Points of attachment for lateral ligaments

Fig. 6.—Vertebra Dentata.

a, Body
b, Ring
c, Articular processes
d, Transverse processes
e, Spinous process
f, Foramina for vertebral arteries and veins
n, Processus dentatus

Fig. 7.—Seventh Rib.

a, Sacral margin with groove for intercostal nerve, artery, and vein
b, Head
c, Point of articulation to transverse process of vertebra
d, Tubercle
e, Depression for mucilaginous glands
f, Angle
g, Sternal extremity

Fig. 8.—First Rib.

h, Tubercle for attachment of scalenus muscle
i, Depression made by subclavian artery
k, Head

PLATE III.

Fig. 1.—Female Pelvis.

ʜ, Body of os ischii
ꜱ, Crista of os ilium
ᴏ, Foramen obturatorium
ʏ, Promontory of os sacrum

a, Os sacrum
b, Os coccygis
c, Articular processes of os sacrum
f, Sacro-iliac-synchondrosis
h, Os ilium
n, Foramina for sacral nerves
r, Acetabulum
s, Anterior superior spinous process of os ilium
t, Anterior inferior spinous process of os ilium
x, Depression made by psoas magnus and iliacus internus muscles
y, Brim or inlet

ɛ, Spine of os pubis
ɡ, Surface for pectinalis muscle
ɦ, Body of os pubis
ɨ, Crista pubis
ȷ, Attachment of crus clitoridis
ɬ, Symphysis pubis
ɯ, Origin of gracilis muscle
ƿ, Linea-ileo-pectinea

1, Origin of erector clitoridis
2, Origin of adductor magnus muscle
7, Origin of quadratus femoris muscle
8, Spine of os ischii

Fig. 2.—Male Pelvis.

H, Body of os ischii
s, Crista of os ilium
U, Obturator foramen
Y, Promontory of os sacrum

a, Os sacrum
b, Os coccygis
c, Articular processes of os sacrum
f, Sacro-iliac-synchondrosis
h, Os ilium
n, Foramina for sacral nerves
r, Acetabulum
s, Anterior superior spinous process of os ilium
t, Anterior inferior spinous process of os ilium
x, Depression made by psoas and iliacus internus muscles
y, Brim or inlet

e, Spine of os pubis
g, Surface for pectinalis muscle
h, Body of os pubis
i, Crista pubis
j, Attachment of crus penis
k, Symphysis pubis
m, Origin of gracilis muscle
y, Linea-ileo-pectinea

1, Surface for erector penis
2, Surface for adductor magnus muscle
7, Surface for quadratus femoris muscle
8, Spine of os ischii

Fig. 3.—Fetal Pelvis.

H, Body of os ischii
s, Crista of os ilium
U, Obturator foramen

a, Os sacrum
b, Os coccygis
c, Articular processes of os sacrum
f, Sacro-iliac-synchondrosis
h, Os ilium
n, Foramina for sacral nerves
o, Cartilage of acetabulum
r, Acetabulum
s, Anterior superior spinous process of os ilium

h, Body of os pubis
k, Symphysis pubis
p, Cartilaginous junction of crura of pubes and ischium

Fig. 4.—Os Coccygis.

a, Surface by which it is articulated to os sacrum
b, Bodies of the different portions
c, Articular processes
d, Shoulders
n, Notch for last spinal nerves

PLATE IV.

Fig. 1.—Front View of Skull.

A, Zygomatic process of os malæ

a, Zygomatic process of temporal bone
d, External angular process of os frontis
e, Temporal ridge
f, Mental foramen
n, Superciliary notch

1, Os frontis
3, Os parietale
7, Os temporis
9, Os sphenoides
11, Os ethmoides
15, Os maxillare superius
17, Os lacrymale
19, Os malæ
23, Os spongiosum inferius
24, Os vomeris
25, Os maxillare inferius

Fig. 2.—Basilar View of Skull.

A, Zygomatic process of os malæ
R, Spheno-maxillary aperture

v, Palatine plate of superior maxillary bone

a, Zygomatic process of temporal bone 7
a, Protuberance of occipital bone
b, Tubercle of zygomatic process of temporal bone
c, Inferior transverse ridge of occipital bone
d, Perpendicular ridge of occipital bone
e, Glenoid cavity
f, Foramen stylo-mastoideum
g, Cuneiform process of os occipitis
i, Condyles of os occipitis
l, Unciform process of sphenoid bone
m, Mastoid process of temporal bone
n, Groove for occipital artery
q, Styloid process
t, Canalis carotideus
w, Foramen lacerum posterius
x, Internal pterygoid process
z, External pterygoid process

b, Superior transverse ridge of occipital bone

4, Foramen ovale
5, Foramen spinosum
7, Temporal bone
22, Palatine plate of os palati
24, Os vomeris

Fig. 3.—Internal Basilar View of Cranium.

b, Crista galli of os ethmoides
c, Transverse spinous process of os sphenoides
h, Orbitary plates of os frontis
i, Groove in os parietale made by lateral sinus
o, Foramen condyloideum posterius
p, Foramen condyloideum anterius
q, Superior portion of internal perpendicular ridge of os occipitis
r, Internal transverse ridge of os occipitis
s, Inferior portion of internal perpendicular ridge of os occipitis
t, Depressions in os occipitis for posterior lobes of cerebrum
u, Depressions in os occipitis for lobes of cerebellum
u, Internal auditory foramen
v, Petrosal ridge
w, Foramen lacerum posterius
y, Fossa in os occipitis for lateral sinus
z, Fossa in os occipitis for lateral sinus

1, Foramen opticum
2, Foramen lacerum anterius
3, Foramen rotundum
4, Foramen ovale
6, Foramen cœcum
7, Temporal bone
10, Anterior clinoid processes
11, Posterior clinoid processes
12, Cella turcica
14, Depression made by decussation of optic nerves
14, Foramen for auditory twig of Vidian nerve
16, Depressions for middle lobes of cerebrum
20, Depression for medulla oblongata

Fig. 4.—Vertical Section of Skull.

a, Nasal process of superior maxillary bone

d, Spinous process of os palati

b, Crista galli of os ethmoides
c, Nasal lamella of os ethmoides
d, Spinous process of os maxillare superius
d, Turbinated portion of os ethmoides
f, Frontal sinuses
f, Ethmoid cells
i, Fossa on parietal bone made by lateral sinus
n, Line of attachment of falx cerebri
o, Spheno-palatine foramen
q, Ridge of occipital bone, affording attachment to falx cerebri
r, Transverse ridge giving attachment to tentorium cerebelli
v, Petrosal ridge
x, Internal pterygoid process of os sphenoides
z, Fossa made by lateral sinus

9, Sphenoid cells
13, Os nasi
23, Os spongiosum inferius

Fig. 5.—Fetal Os Occipitis.

Fig. 6.—Fetal Skull.

a, Anterior fontanelle
b, Posterior fontanelle

1, Frontal bone
3, Parietal bone
7, Temporal bone

Fig. 7.—Vertical Section of a Vertebra.

Fig. 8.—Section of Patella.

Fig. 9.—Fetal Os Sphenoides.

Fig. 10.—Section of Os Femoris.

a, Indicating white line, originally cartilage
b, Indicating white line, originally cartilage
c, Indicating white line, originally cartilage
d, Dense shaft

PLATE V.

BONES OF CRANIUM.

Fig. 1.—External View of Os Frontis.

a, Nasal process
b, Internal angular process
c, Superciliary ridge
d, External angular process
e, Temporal ridge
f, Elevations made by frontal sinuses
g, Centres of ossification in the fetus
h, Orbitary depressions
l, Temporal depression
n, Superciliary foramen
2, Circular serrated edge, forming coronal suture
18, Circular serrated edge, forming coronal suture

Fig. 2.—Internal View of Os Frontis.

a, Nasal process
b, Internal angular process
c, Superciliary ridge
d, External angular process
e, Temporal ridge
h, Orbitary depressions
i, Depression for cartilaginous pulley of superior oblique muscle of eye
k, Depressions for lacrymal glands
m, Depressions assisting to form ethmoid cells
n, Superciliary foramina
o, Apertures of frontal sinuses
q, Ridge giving attachment to falx cerebri
x, Groove made by superior longitudinal sinus
2, Circular serrated edge, forming coronal suture
6, Foramen cœcum
18, Circular serrated edge, forming coronal suture

Fig. 3.—External View of Os Parietale.

a, Superior or coronal side
b, Anterior or glabellar side
c, Inferior or basilar side
d, Posterior or inial side
e, Temporal ridge
f, Anterior inferior angle, or spinous process
g, Superior posterior angle
k, Temporal depression
o, Foramen which transmits a vein that terminates in the superior longitudinal sinus
ɛ, Anterior superior angle
ƀ, Posterior inferior angle
4, Indicating division between squamous suture and its additamentum

Fig. 4.—Internal View of Os Parietale.

a, Superior or coronal side
b, Anterior or glabellar side
c, Inferior or basilar side
d, Posterior or inial side
f, Anterior inferior angle, or spinous process
g, Posterior superior angle
i, Impression made by lateral sinus
n, Groove formed by the superior longitudinal sinus
ɛ, Anterior superior angle
ƀ, Posterior inferior angle

Fig. 5.—External View of Os Occipitis.

a, Central protuberance
c, Inferior transverse ridge
d, Perpendicular ridge
e, Groove made by occipital artery
f, A ridge giving attachment to rectus lateralis muscle
g, Cuneiform process
i, Condyloid processes
k, Foramen magnum
m, Surface to which perpendicular ligament is attached
n, Surface to which lateral ligament is attached
o, Posterior condyloid foramina
p, Anterior condyloid foramina
ƀ, Superior transverse ridge
f, Ridge made by recti antici muscles

Fig. 6.—Internal View of Os Occipitis.

g, Cuneiform process
k, Foramen magnum
o, Posterior condyloid foramina
p, Anterior condyloid foramina
q, Perpendicular ridge giving attachment to falx cerebri
r, Transverse ridge giving attachment to tentorium
s, Perpendicular ridge giving attachment to falx cerebelli
t, Depressions for posterior lobes of cerebrum
u, Depressions for lobes of cerebellum
w, Portion of foramen lacerum posterius
x, Groove made by superior longitudinal sinus
y, Depression made by lateral sinus
z, Groove made by lateral sinus

1, 2, 3, } Serrated edge forming lambdoidal suture

20, Depression made by medulla oblongata

Fig. 7.—External View of Os Temporis.

E, Depression which assists in forming glenoid cavity
T, Inner aperture of carotid canal

a, Zygomatic process
b, Oblong elevation, upon which the condyloid process of inferior maxillary bone moves
c, *c*, Squamous portion
d, Mamillary portion
e, Glenoid cavity
f, Stylo-mastoid foramen
g, Fissure of Glasserus
k, Temporal depression
m, Mamillary process
n, Fossa made by occipital artery
q, Styloid process
r, Vaginal process
t, Outer aperture of carotid canal
w Foramen lacerum posterius
x, Auditory ring

b, Fossa made by digastric muscle
l, Foramen auditorium externum

9, Foramen giving entrance to a vein which joins lateral sinus

Fig. 8.—Internal View of Os Temporis.

a, Zygomatic process
c, *c*, Squamous portion
d, Mamillary portion
q, Styloid process
r, Vaginal process
t, Outer aperture of carotid canal
u, Foramen auditorium internum
v, Petrosal ridge
w, Foramen lacerum posterius
y, *z*, Fossa made by lateral sinus
j, Groove made by middle meningeal artery
9, Foramen which transmits a vein to join lateral sinus

Fig. 9.—External View of Os Sphenoides.

a, Body of the bone, or azygos process
b, Ethmoidal process
c, Transverse spinous processes
d, Spinous process
e, Styliform process
f, Temporal processes
h, Orbitary plates
i, Groove made by temporal twig of superior maxillary nerve
k, Temporal depressions
l, Unciform processes
m, Triangular processes
x, Internal pterygoid processes
z, External pterygoid processes
1, Foramina optica
2, Foramina lacera anteriora
3, Foramina rotunda
4, Foramina ovalia
5, Foramina spinosa
8, Foramina Vidiana
9, Apertures to sphenoidal cells

Fig. 10.—Internal View of Os Sphenoides.

b, Ethmoidal process
c, Transverse spinous processes
d, Spinous processes
e, Styliform processes
f, Temporal processes
l, Unciform processes
x, Internal pterygoid processes
z, External pterygoid processes
g, Cuneiform process
1, Foramina optica
2, Foramina lacera anteriora
3, Foramina rotunda
4, Foramina ovalia
5, Foramina spinosa
8, Foramina Vidiana
10, Anterior clinoid processes
11, Posterior clinoid processes
12, Depression for pituatary gland
13, Fossæ made by carotid arteries
14, Groove made by optic nerve
16, Depressions which lodge middle lobes of cerebrum

Fig. 11.—Internal View of Os Ethmoides.

a, Cribriform lamella
b, Crista galli
e, Ossa plana

Fig. 12.

c, Nasal lamella
d, Turbinated portions
e, Ossa plana
f, Ethmoidal sinuses

PLATE VI.

BONES OF THE FACE.

Fig. 13.—External View of Os Nasi.

H, Superior edge
N, Inferior edge
h, Superior or glabellar extremity

Fig. 14.—Internal View of Os Nasi.

H, Superior edge
N, Inferior edge
h, Superior or glabellar extremity

Fig. 15.—External View of Superior Maxillary Bone.

B, Nasal process
D, Lacrymal depression
H, Orbitary process

d, Spinous process
g, Bulbous process
l, Malar process
n, Alveolar processes
o, Infra-orbitary foramen or canal
p, Origin of levator anguli oris
q, Origin of depressor labii superioris
r, Origin of inferior oblique muscle of the eye
t, Point where the ligament of the tarsi is fixed

Fig. 16.—Internal View of Superior Maxillary Bone.

A, Antrum maxillare
B, Nasal process
C, Point of connexion with orbitary process of os palati
D, Lacrymal depression
V, Palatine process

b, Incisive hole
d, Spinous process
e, Ridge which supports the inferior spongy bone
s, Fossa contributing to form palato-maxillary canal
x, Pterygoid depression for palate bone
z, Pterygoid depression for palate bone

Fig. 17.—Orbitary View of Lacrymal Bone.

E, Perpendicular ridge
F, Orbitary plate
G, Lacrymal depression

Fig. 18.—Nasal View of Lacrymal Bone.

Fig. 19.—External View of Os Malæ.

A, Zygomatic process
D, Superior orbitary process
K, Maxillary process
L, Inferior orbitary process

Fig. 20.—Internal View of Os Malæ.

A, Zygomatic process
D, Superior orbitary process
K, Maxillary process
L, Inferior orbitary process

b, Orbitary depression
k, Temporal depression

Fig. 21.—Internal or Nasal View of Os Palati.

E, Ridge that gives support to inferior spongy bone
P, Nasal lamella
d, Spinous ridge
a, Anterior or proper orbitary process
b, Posterior orbitary process
n, Palatine plate
o, Spheno-palatine foramen
x, Pterygoid portion

Fig. 22.—External View of Os Palati.

P, Nasal lamella
d, Spinous ridge
a, Anterior or proper orbitary process
b, Posterior orbitary process
n, Palatine plate
o, Spheno-palatine foramen
s, Palato-maxillary canal
x, Internal pterygoid depression
y, Middle pterygoid depression
z, External pterygoid depression

Fig. 23.—External or Antral View of Inferior Spongy Bone.

Fig. 24.—Vomer.

a, Depression that receives azygos process of sphenoid bone
b, Edge joined to cartilaginous septum
c, Edge joined to nasal lamella of ethmoid bone
d, Edge joined to spinous ridges of superior maxillary and palate bones

Fig. 25.—External View of Inferior Maxillary Bone.

a, Base
b, Condyles
c, Symphysis menti
d, Angle
e, Cervix
f, Mental foramen
g, Ridge for buccinator muscle
h, Point of origin of levator labii inferioris
i, Point of origin of depressor labii inferioris
k, Coronoid processes
o, Point of attachment of external pterygoid muscle

Fig. 26.—Internal View of Inferior Maxillary Bone.

b, Condyles
d, Angle
e, Cervix
k, Coronoid processes
m, Point of origin of anterior heads of digastric muscles
n, Point of origin of genio-hyoglossi muscles
o, Point of insertion of external pterygoid muscle
p, Ridge for mylo-hyoideus muscle
q, Rough surface for insertion to internal pterygoid muscle
r, Foramen that gives entrance to osseous branch of inferior maxillary nerve, &c.
s, Groove made by mylo-hyoideal twig of inferior maxillary nerve

Fig. 27.—Internal view of Superior Maxillary and Palate Bones joined.

A, Antrum maxillare
B, Nasal process
D, Lacrymal fossa
P, Nasal lamella of palate bone
V, Palatine plate of superior maxillary bone
d, Spinous ridge of palate bone
d, Spinous ridge of superior maxillary bone
n, Palatine plate of palate bone
x, Pterygoid depression of palate bone
z, Pterygoid depression of palate bone
16 Only indicates the superior maxillary bone, as
21 Points out the palate bone, and
23 Marks the inferior spongy bone

Fig. 28.—View of Deciduous and Permanent Teeth.

Fig. 29.—External View of Frontal, Ethmoidal, Sphenoidal, and Occipital Bones in connexion.

d, Turbinated portions of ethmoid bone
f, Ethmoid cells
k, Foramen magnum
2, Foramina lacera anteriora
3, Foramina rotunda
4, Foramina ovalia
5, Foramina spinosa
8, Foramina Vidiana

PLATE VII.

Fig. 1.—View of the Dorsum Scapulæ.

A, Surface of teres major muscle
a, Point of origin of long head of triceps muscle
a, Inferior costa
a, Surface of teres minor muscle
b, Superior costa
c, Base or insertion of rhomboidei muscles
d, Posterior superior angle
e, Anterior superior angle
f, Inferior angle
g, Infra-spinal fossa
h, Spine
o, Supra-scapular notch
r, Point of insertion of levator scapulæ muscle
g, Supra-spinal fossa
2, Cervix
3, Origin of long head of biceps muscle
5, Coracoid process
6, Acromion process
7, Point of attachment of proper anterior ligament of scapula
9, Point of attachment of conoid and trapezoid ligaments

Fig. 2.—View of the Venter Scapulæ.

a, Origin of long head of triceps muscle
b, Superior costa
d, Posterior superior angle
e, Anterior superior angle, or glenoid cavity
f, Inferior angle
i, Subscapular fossa
k, Base or line of insertion of serratus magnus muscle
o, Supra-scapular notch
2, Cervix
3, Point of origin of long head of biceps muscle
5, Coracoid process
6, Acromion process
8, Surface to which the clavicle is articulated
9, Point of attachment of conoid and trapezoid ligaments

Fig. 3.—Anterior or Palmar View of Os Brachii.

a, Shaft of the bone
b, Trochlear surface
c, Head
d, Trochlear surface on which radius moves
e, Cervix
f, Internal or ulnar tubercle
g, Radial or external tubercle
h, Bicipital fossa
i, Scabrous surface made by coraco-brachialis muscle
l, Internal or ulnar ridge affording origin to pronator and flexor muscles
m, Internal or ulnar ridge of bicipital groove
n, External or radial ridge of bicipital groove
o, Rough surface made by deltoid muscle
p, Internal or ulnar condyle
q, External or radial condyle
y, Lesser sigmoid cavity

Fig. 4.—Posterior or Anconal View of Os Brachii.

g, Point of attachment of teres minor muscle
y, Groove made by ulnar nerve
a, Shaft of the bone
b, Trochlear surface
c, Head
e, Cervix
k, External or radial ridge giving origin to supinators and extensors
l, Internal or ulnar ridge giving origin to pronator and flexor muscles
o, Surface into which is inserted the deltoid muscle
p, Inner or ulnar condyle
q, Outer or radial condyle
r, Ridge affording origin to second head of the triceps muscle
s, Ridge for third head of the triceps muscle
t, Channel made by spiral nerve
z, Greater sigmoid cavity

Fig. 5.—Anterior or Palmar or Thenal View of Ulna and Radius.

a, Body or shaft of radius
b, Tubercle of radius
c, Cervix of radius
d, Smooth surface around head of radius
e, Cup-like cavity of head of radius
f, Ridge giving insertion to supinator radii brevis
g, Surface affording insertion to pronator radii teres
h, Ulnar angle of radius to which interosseous ligament is attached
i, Foramen for nutritious artery
k, Surface for insertion of pronator quadratus
l, Surface for insertion of supinator radii longus
s, Styloid process
t, Greater sigmoid cavity

1, Body or shaft of ulna
2, Point affording insertion to triceps muscle
3, Coronoid process
4, Point of attachment of ulnar lateral ligament of elbow joint
5, Olecranon
6, Ancon
8, Greater sigmoid cavity
10, Radial angle giving attachment to interosseous ligament
11, Foramen for medullary vessels
14, Styloid process
16, Groove made by ulnar artery and nerve
17, Smooth surface opposed to cuneiform bone of wrist
18, Oblique ridge affording insertion to pronator quadratus

Fig. 6.—Posterior or Anconal View of Ulna and Radius.

a, Body of radius
c, Cervix
d, Smooth circular surface around head of radius
g, Scabrous surface into which pronator teres is inserted
h, Ulnar angle of radius to which interosseous ligament is attached
n, Tubercle on distal extremity of radius
o, Groove made by extensor secundi internodii pollicis
p, Groove made by extensor digitorum communis and indicator muscles
q, Depression made by radial extensors
r, Groove made by extensor ossis metacarpi and extensor primi internodii pollicis

Fig. 6. *(Continued.)*

s, Styloid process
z, Lesser sigmoid cavity of radius

1, Body or shaft of ulna
2, Insertion of triceps muscle
5, Olecranon
6, Ancon
7, Insertion of anconeous muscle
12, Attachment of flexor ulnaris muscle
13, Smooth surface opposed to lesser sigmoid cavity of radius
14, Styloid process
15, Groove made by extensor carpi ulnaris

Fig. 7.—View of the back of the Hand.

a, Os scaphoides
b, Os lunare
c, Os cuneiforme
e, Os trapezium
f, Os trapezoides
g, Os magnum
h, Os unciforme

1, Metacarpal bone of thumb
2, Metacarpal bone of forefinger
3, Metacarpal bone of middle finger
4, Metacarpal bone of ring finger
5, Metacarpal bone of little finger
6, First bone of thumb
7, First bone of forefinger
8, First bone of middle finger
9, First bone of ring finger
10, First bone of little finger
11, Second bone of forefinger
12, Second bone of middle finger
13, Second bone of ring finger
14, Second bone of little finger
15, Last bone of thumb
16, Third or last bone of forefinger
17, Third or last bone of middle finger
18, Third or last bone of ring finger
19, Third or last bone of little finger

Fig. 8.—View of the Palm of the Hand.

a, Os scaphoides
b, Os lunare
c, Os cuneiforme
d, Os pisiforme
e, Os trapezium
f, Os trapezoides
g, Os magnum
h, Os unciforme

1, Metacarpal bone of thumb
2, Metacarpal bone of forefinger
3, Metacarpal bone of middle finger
4, Metacarpal bone of ring finger
5, Metacarpal bone of little finger
6, First bone of thumb
7, First bone of forefinger
8, First bone of middle finger
9, First bone of ring finger
10, First bone of little finger
11, Second bone of forefinger
12, Second bone of middle finger
13, Second bone of ring finger
14, Second bone of little finger
15, Last bone of thumb
16, Last or third bone of forefinger
17, Last or third bone of middle finger
18, Last or third bone of ring finger
19, Last or third bone of little finger
20, Sesamoid bones on head of metacarpal bone of thumb
21, Lateral ridges affording attachment to vaginal ligaments of flexor muscles
22, Points of insertion of flexor digitorum sublimis
23, Points of insertion of flexor digitorum profundus

PLATE VIII.

Fig. 1.—Posterior or Dorsal View of Os Sacrum.

a, Body
c, Articular processes
d, Sacro-iliac-synchondrosal surface
e, Spinous processes
g, Tubercle for sacro-ischiadic ligaments
l, Canal for cauda equina
n, Foramina for sacral nerves

Fig. 2.—External View of Os Innominatum.

u, Tuberosity of os ischii
a, Acetabulum
s, Crista of os ilium
v, Obturator foramen

a, Origin of gluteus maximus muscle
b, Origin of gluteus medius muscle
c, Origin of gluteus minimus muscle
d, Origin of tensor vaginæ femoris muscle
e, Attachment of capsular ligament of hip-joint
s, Anterior superior spinous process of os ilium
f, Posterior superior spinous process of os ilium
t, Inferior anterior spinous process of os ilium
v, Inferior posterior spinous process of os ilium
z, Arch of great sacro-ischiadic notch

b, Body of os pubis
f, Attachment of crus penis
q, Origin of adductor brevis muscle
m, Niche for passage of obturator vessels

1, Origin of erector penis
2, Origin of adductor magnus
3, Origin of biceps and semitendinosus muscles
4, Origin of semi-membranosus muscle
5, Origin of gemellus inferior muscle
6, Attachment of long or outer sacro-ischiadic ligament
8, Spine of os ischii
9, Sinuosity around which the obturator internus muscle plays
10, Deficiency of osseous brim of acetabulum
12, Highest margin of acetabulum

Fig. 3.—Anterior or Patellar View of Os Femoris.

a, Body or shaft
b, Head
c, Depression for attachment of ligamentum teres
d, Cervix
e, Trochanter major, where it gives attachment to gluteus minimus muscle
f, Trochanter minor
g, Ridge to which capsular ligament is attached

i, Rut at trochanter major, giving insertion to pyriformis, obturator externus and internus, with gemelli muscles
k, Point of insertion of triceps muscle
m, Trochlear surface opposed to patella
n, Trochlear surface opposed to patella

r, Point of attachment of gluteus medius muscle

Fig. 4.—Posterior or Popliteal View of Os Femoris.

a, Superior tibial division of linea aspera, affording attachment to pectinalis muscle
e, Smooth surface made by gluteus maximus

a, Linea aspera
b, Head
d, Cervix
f, Trochanter minor
h, Ridge affording attachment to quadratus femoris muscle
i, Rut at the root of trochanter major, giving insertion to several muscles
k, Point of insertion of triceps muscle
l, Smooth surface of linea aspera, made by superficial femoral artery and vein
m, Internal condyle
n, External condyle
p, Tubercle giving origin to fibular head of gastrocnemius externus muscle
r, Surface giving origin to tibial head of gastrocnemius externus muscle
s, Fossa giving origin to popliteus muscle
t, Cavity or notch, to which are attached crucial ligaments

a, Superior fibular division of linea aspera, affording attachment to gluteus maximus muscle
e, Point of attachment of gluteus medius muscle

Fig. 5.—External View of Patella.

a, Point of insertion of rectus and crureus muscles
b, Point of insertion of vastus internus muscle
c, Point of insertion of vastus externus muscle
d, Point of attachment of patellar ligament

Fig. 6.—Internal or Popliteal View of Patella.

d, Point of attachment of patellar ligament
e, Point of attachment of capsular ligament
m, Surface opposed to internal condyle of os femoris
n, Surface opposed to external condyle of os femoris

Fig. 7.—Anterior or Patellar View of Tibia and Fibula.

a, Body or shaft of tibia
d, Tubercle of tibia
e, Surface into which inner hamstring muscles are inserted
h, Surface to which fibula is articulated
q, Styloid process or malleolus internus of tibia
m, Fibular angle affording attachment to interosseous ligament
r, Smooth articular surface for astragalus
s, Rough depression affording attachment to fibula

1, Exterior angle of body or shaft of fibula
2, Proximal extremity of fibula
4, Tibial angle giving attachment to interosseous ligament
9, Distal extremity of fibula
10, Coronoid process or malleolus externus
11, Smooth surface opposed to astragalus

Fig. 8.—Posterior or Popliteal View of Tibia and Fibula.

b, Elevation on head of tibia giving attachment to crucial ligaments
c, Smooth depressions on head of tibia
f, Point of insertion of semimembranosus muscle
g, Point of attachment of posterior crucial ligament
i, Smooth surface made by popliteus muscle
k, Oblique ridge made by gastrocnemius internus muscle
m, Fibular angle giving insertion to interosseous ligament
n, Foramen for nutritious vessels
n, Groove made by flexor longus digitorum pedis and tibialis posticus muscles
o, Posterior tibial angle made by tibialis posticus muscle, &c.
p, Groove made by flexor longus muscle
q, Styloid process or malleolus internus

1, Exterior angle of body or shaft of fibula
2, Proximal extremity of fibula
3, Foramen for nutritious vessels
4, Tibial angle giving attachment to interosseous ligament
6, Surface giving origin to fibular head of gastrocnemius internus muscle
9, Distal extremity of fibula
10, Coronoid process or malleolus externus
12, Cavity for mucilaginous glands
13, Groove made by peronei muscles

Fig. 9.—View of Upper Part of the Foot.

a, Surface opposed to fibula

a, Os astragalus
b, Os naviculare
c, Os calcis
d, Os cuneiforme internum
e, Os cuneiforme medium
f, Os cuneiforme externum
g, Os cuboides
k, Depression made by flexor longus pollicis pedis
m, Smooth projection of astragalus
n, Smooth surface of naviculare where it joins cuboides
t, Projection of metatarsal bone of little toe, affording insertion to peroneus brevis muscle

r, Smooth surface of os calcis opposed to os cuboides *g*
g, Fossa made by peroneus longus muscle

1, Situated on os naviculare *b*, indicates surface opposed to os cuneiforme internum *d*
1, Metatarsal bone of great toe
2, Situated on os naviculare *b*, indicates surface opposed to os cuneiforme medium *e*
2, Situated on os cuneiforme externum *f*, indicates surface opposed to metatarsal bone 2 of index toe
2, Metatarsal bone of index toe
3, Situated on os naviculare *b*, indicates surface opposed to os cuneiforme externum *f*
3, Situated on os cuneiforme externum *f*, indicates surface opposed to metatarsal bone 3 of middle toe
3, Metatarsal bone of middle toe
4, Situated on os cuneiforme externum *f*, indicates surface opposed to metatarsal bone of ring toe 4
4, Metatarsal bone of ring toe
5, Metatarsal bone of little toe
6, First bone of great toe
7, Last bone of great toe
8, First bone of index toe
9, Second bone of index toe
10, Third bone of index toe
11, First bone of middle toe
12, Second bone of middle toe
13, Third bone of middle toe
14, First bone of ring toe
15, Second bone of ring toe
16, Third bone of ring toe
17, First bone of little toe
18, Second bone of little toe
19, Third bone of little toe

END OF PART I.

J. Brewster, Printer,
Edinburgh.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART II.—THE BLOOD-VESSELS AND NERVES.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, LONDON; AND

HODGES AND M'ARTHUR, DUBLIN.

1823.

EDINBURGH:
Printed by John Brewster,
11, Society.

TO

WILLIAM BURNETT, ESQUIRE, M.D.,

MEDICAL COMMISSIONER OF HIS MAJESTY'S NAVY,

&c. &c. &c.

THIS BOOK IS DEDICATED,

AS

A MARK OF RESPECT

FOR HIS HIGH PROFESSIONAL ATTAINMENTS,

AND

AS A TOKEN OF ESTEEM FOR HIS INTRINSIC WORTH

AND VALUED FRIENDSHIP;

BY

HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART II.

BLOOD-VESSELS AND NERVES

OF THE

HEAD AND TRUNK.

PREFACE.

WHEN I began the First Part of this Work, I little thought that I should have lived to witness the sentiments of my late worthy preceptor Mr. John Bell so completely verified. "If Anatomy," said this excellent surgeon, "is to be acquired only by dissection, then must we understand by a school of anatomy a school of dissection; yet those who have had the happiness of prosecuting their studies in foreign universities, will hardly believe it, that there is at least one place of education much celebrated, and worthy to be so, where the study of anatomy is denied or proscribed; where not only it is not praise-worthy, but even dangerous to propose dissections." When I read this in my early years of study, I conceived it to be the sentiment of a disappointed man, and never dreamt that this literary city, and this enlightened age, would endeavour to suppress a study which has been universally

allowed to form the basis of all surgical and medical science; a study, moreover, which of all others furnishes the most certain data for confuting the Atheist,* and demonstrating the existence of a great and intelligent First Cause. Fortunately for science, however, and particularly for that profession, the humane and charitable duties of which consist in alleviating pain and sickness, and checking the progress of disease, while one school is about to be abolished, others are at the same time rising into reputation: yet who can think, without the most heartfelt regret, that the City of Edinburgh, which has extended its fame for literature, philosophy, and medicine, to the most distant regions of the earth, is doomed to dwindle into comparative insignificance, and that its celebrated professors, whose labours have reflected honour on their age and country, may shortly be reduced to lecture to empty benches, instead of those overflowing audiences collected from almost every quarter of the world, and, till a miserable prejudice interfered to throw insurmountable obstacles in the way of their progress, zealous in the acquisition of

* See Paley's Natural Theology, and other works of a similar character.

science. In place of living in a civilized and enlightened period, we appear as if we had been thrown back some centuries into the dark ages of ignorance, bigotry, and superstition. Prejudices worthy only of the multitude have been conjured up and appealed to, in order to call forth popular indignation against those whose business it is to exhibit demonstratively the structure of the human body, and the functions of its different organs; the public journals, from a vicious propensity to pander to the vulgar appetite for excitement, have raked up and industriously circulated stories of the exhumation of dead bodies, tending to exasperate and inflame the passions of the mob; and persons who, by their own showing, are friendly to the interests of science, have, in the excess of their zeal, that bodies should remain undisturbed in their progress to decomposition, laboured to destroy in this country, that art, whose province it is to free living bodies from the consequences inseparable from accident and disease. And, which is worst of all, the prejudices of the multitude have been confirmed and rendered inveterate by the proceedings in our courts of justice, which have visited with the punishment due only to felons, the unhappy persons necessarily em-

ployed, in the present state of the law, in procuring subjects for the dissecting-room.

Now, until anatomy be publicly sanctioned in Edinburgh, as in the days of the enlightened and truly worthy Drummond,* the Edinburgh school of medicine can never flourish, or do justice to the profession, or enter into competition with its rivals; and until that period arrive, empiricism and quackery will triumph, and fanaticism exult in its miracles; while the wounded in the field of battle, and the dying on the bed of sickness, will be left to the care of ignorance and cruelty. Who does not shudder when he thinks of the number of young medical gentlemen, who, after a year or two of grinding, obtain a degree or a diploma,† and who thus, ignorant of the

* This liberally minded man passed two acts of the Town Council of Edinburgh, authorizing all those who died *friendless* in the correction-house, all *friendless* foundlings, all *friendless* suicides, and all *friendless* executed criminals, to be delivered for *dissection*. Council Regist. 1694. With such encouragement and support, the medical school of Edinburgh could not fail to rise into eminence, and enrich the city with literature and wealth. Without such, were even a Monro primus, or a Haller to rise from his grave, she must sink into oblivion.

† The oppressed Danes have more feeling for their fellow-creatures, and more regard for their medical gentlemen, than is shown in this country. When a candidate presents himself for a diploma, he is in his first trial put into a room with a *subject*, a case of instruments, and a memorandum, informing him that he is to display the anatomy of the face and neck, or that of the upper extremity, or that of the lower extremity. By the anatomy is to be understood the blood-vessels,

very elements of their profession, annually go to the East and West Indies, and to the army and navy, where they have the charge of hundreds of their suffering fellow-creatures. Little are these individuals aware of the fearful responsibility which awaits them in the hour of sickness, or on the field of battle; and little do the public think, that they are the instruments of such cruelty and murder.* Without *subjects* it is as absurd to attempt to educate a surgeon or a physician, as to instruct a watchmaker without permitting him to inspect the mechanism of a watch.

nerves, and muscles. This task generally engages him for a whole day; no one is allowed to approach him; he is left entirely to his own resources. When his work is accomplished he rings a bell, which summons the professors to judge of his abilities. Were such a mode of examination employed in Edinburgh, it is to be feared the bell would be the tocsin!

* The melancholy fate of Sir Phillip Sidney, the ornament of the court of Queen Elizabeth, should long since have opened the eyes of the British public. This great captain, profound statesman, accomplished gentleman, elegant scholar, and pious man, was cut off in the bloom of manhood, and in the zenith of his career, by the simple wound of a musket-bullet in his left leg, a little above the knee, "when extraction of the ball, or amputation of the limb," says his biographer, "would have saved his inestimable life; but the surgeons and physicians were unwilling to practise the one, and knew not how to perform the other. He was variously tortured by a multitude of surgeons and physicians for three weeks!" This heart-rending picture is the counterpart of many which have occurred in our own time. Many of the amputations, nearly all the operations of puncturing the bladder, which I have either witnessed or performed myself, have been the result of the mal-practice of other surgeons.

In such a state of things, it is hoped that these Plates will form some substitute for the subject. The original design was to aid the student in dissection, and to assist him in his attendance on lectures; and they are all faithfully drawn, either by the Author or W. H. Lizars, from dissections done by the former, or his late assistant Mr. Cooper, now surgeon at Dundee, and who from his anatomical knowledge should be capable of operating in a manner equal to the first surgeon in the kingdom.

The Author has been careful to represent the different objects as little disturbed as possible, particularly those comprehending surgical anatomy, so that the dissector has only to consider the removal of the integuments and cellular membrane in order to arrive at the same parts; as, for example, in the first representation of the head and neck. The same observation is applicable to the practitioner either in the army, in the navy, or in the city. He has only to compare the different views of the parts, and to calculate the depth of integuments, before operating. The knife should not be held as a pen, but with its cutting edge at right angles to the surface of the skin, so as that the operator may sweep and not piddle with the scalpel. The practice

should be the same in dissecting, that the student may learn how to apply his anatomical dexterity to practice. In the engraving of the Plates great attention has been bestowed in the representation of the arteries, veins, and nerves, that they might be easily distinguished from each other. Thus the arteries are executed in circular lines, the veins in longitudinal lines, and the nerves in dots; by which means each structure is characterized.

For the convenience of the more advanced part of the profession, the Author has been induced to mark the Plates and letters of reference in the Contents; and also to give a separate Index to the letters of reference contained in the Plates. At the same time, he earnestly recommends to the student to disregard these short explanations, and only to be satisfied with the most attentive study of the descriptions at full length contained in the text.

39, *St. Andrew Square*,
1823.

CONTENTS.

	Page
Heart, (Pl. I. D,)	1
Pericardium, (Pl. I. C,)	1
Lungs, (Pl. I. and IV. G, and Pl. III. fig. 1, G,)	2
Arteries of the Trunk,	2
Pulmonary Artery, (and) (Pl. I. F, II. figs. 1, 3, 4, 5, 6, F, III. fig. 1, f,)	4
Aorta, (divided into) (Pl. I. II. IV. E, V. VI. E, e,)	13
Thoracic Aorta, (gives origin to) (Pl. I. II. IV. V. E,)	13
Coronary Arteries of the Heart, (Pl. I. II. r, *s*,)	6
* Arteria Innominata, (Pl. I. IV. VII. Q,) (see also pages 38 and 66,)	14
† Common Carotid Artery, (Pl. I. IV. VII. VIII. IX. P,) (see also p. 38,)	14
‡ Subclavian Artery, (Pl. I. IV. VII. VIII. IX. H,) (see also p. 66, and Pt. III.)	14
Bronchial Arteries, (Pl. IV. dig. 3,) (see also p. 14,)	9
Œsophageal Arteries, (Pl. IV. *b*, *b*,)	14
Intercostal Arteries, (Pl. IV. dig. 12,)	14
Abdominal Aorta, (gives origin to) (Pl. V. VI. e,) (see p. 23 & 25,)	17
Phrenic Arteries, (Pl. IV. V. VI. z,)	22
Cœliac Artery, (divides into) (Pl. VI. n,)	17
Gastric Artery, (Pl. I. IV. V. VI. p,)	17
Hepatic Artery, (Pl. I. IV. V. VI. q,)	17
Splenic Artery, (Pl. I. IV. V. VI. r,)	17
Superior Mesenteric Artery, (Pl. IV. V. VI. R,)	20
Renal Arteries, (Pl. V. VI. c,)	23
Spermatic Arteries, (Pl. V. VI. *g*,)	24
Inferior Mesenteric Artery, (Pl. V. VI. b,)	21
Lumbar Arteries, (Pl. VI. *t*,)	24
divides into	
Sacro-Median Artery, (and) (Pl. VI. *p*,) (see also p. 32,)	25
Common Iliac Arteries, (divide into) (Pl. V. VI. P,)	25

	Page
Common Iliac Arteries, (divide into) (Pl. V. VI. P,)	25
External Iliac Artery, (gives origin within abdomen to) (Pl. I. V. VI. T,) - - - -	26
Epigastric Artery, (Pl. I. V. let. x,) - -	19
Circumflex Iliac Artery, (Pl. V. *c*,) - -	27
Internal Iliac Artery, (gives origin to) (Pl. V. VI. let. v,) (see p. 32,) - - -	26
Ilio-lumbar Artery, (Pl. V. y,) - - - -	32
Sacro-lateral Arteries, (Pl. VI. *a*, *a*,) - -	32
Gluteal Artery, (see also Pt. III.) (Pl. VI. *c*,) -	32
Ischiadic Artery, (see also Pt. III.) (Pl. VI. *f*,) -	33
Obturator Artery, (see also Pt. III.) (Pl. VI. *d*,) -	32
Uterine Artery, (Pl. VI. *e*,) - - -	33
Hemorrhoidal Artery, (Pl. VI. *g*,) - - -	33
Internal Pudic Artery, (Pl. VI. *h*,) (see also Pt. III.) - - - - - -	33
Umbilical Artery of Fetus, (Pl. II. VI. *n*,) -	35
* Arteria Innominata, (divides into) (Pl. I. IV. VII. Q,) (see also pages 14 & 66,) - - -	38
(*Arteries of the Head*,) - -	37
† Common Carotid Artery, (divides into) (Pl. I. IV. VII. VIII. IX. P,) - - -	38
Internal Carotid Artery, (and) (Pl. VII. VIII. dig. 19,) - - - -	40
External Carotid Artery, (gives origin to) (Pl. VII. VIII. IX. G,) - -	40
Superior Thyroideal Artery, (Pl. VII. VIII. IX. *a*,) - - - - -	41
Lingual Artery, (Pl. VII. VIII. *b*,) - -	42
Facial Artery, (Pl. VII. VIII. IX, X. *c*,) -	43
Occipital Artery, (Pl. VIII. IX. X. *d*,) -	44
Auricular Artery, (Pl. VIII. IX. *e*,) - -	45
Internal Maxillary Artery, (Pl. VII. VIII. *f*,) -	46
Ascending Pharyngeal Artery, (Pl. VII. VIII. *h*,) - - - -	47
Temporal Artery, (Pl. VII. VIII. IX. X. *g*,) -	47
(Vertebral Artery is a branch of) (Pl. I. R,)	67
(*Arteries of the Upper Extremity*,) (see also Part III.)	66
‡ Subclavian Artery, (gives origin to) (Pl. I. IV. VII. VIII. IX. H,) (see also p. 38,) - -	66
Superior Intercostal Artery, (Pl. IV. dig. 12,) - -	67
Internal Mammary Artery, (Pl. I. III. fig. 2, dig. 14,) -	67
Vertebral Artery, (properly belongs to the Head,) (Pl. I. R,) - - - -	68
Inferior Thyroideal Artery, (Pl. IV. VII. s,) - -	68
Superficial Cervical Artery, (Pl. VII. VIII. IX. dig. 52,) - - - - -	69
Supra-Scapular Artery, (Pl. VII. VIII. IX. dig. 51,) -	69
Axillary or continuation of Subclavian Artery, see Part III.	

	Page
Veins of the Head.	
Temporal Vein, (and) (Pl. X. y,) - -	49
Facial Vein, (form) (Pl. X. z,) - -	49
External Jugular Vein, (ends in Internal Jugular or Subclavian Vein) (Pl. IX. VIII. D,) - - - -	49
Occipital Vein, (joins either External or Internal Jugular, or Vertebral Vein,) (Pl. X. dig. 90,) - - -	50
Internal Jugular Vein, (continuation of Lateral Sinus, and in the Neck joined by) (Pl. IX. VIII. VII. I. M,) - - -	51
Internal Maxillary Veins, - - -	51
Pharyngeal Veins, (Pl. VIII.) - -	51
Lingual Veins, - - - -	51
Laryngeal Veins, (Pl. IX. T,) - -	51
External Jugular Vein, (Pl. IX. VIII. D,) -	49
Vertebral Vein, (along with) (Pl. I. N,) - -	69
Internal Jugular Vein, terminates in (Pl. IX. VIII. VII. I. M,) - - - - -	51
Veins of the Upper Extremity.	
Subclavian Vein, (continuation of Axillary Vein, joined by) (Pl. I. VII. VIII. *u*, *v*,) -	70
External Jugular Vein, (Pl. IX. VIII. D,) -	70
Internal Jugular Vein, (Pl. IX. VIII. VI. I. M,) -	70
Cervical Veins, (Pl. VIII. IX.) - -	51 & 70
Thyroideal Veins, (Pl. VII. I. O,) - -	71
Vertebral Vein, (properly belongs to the Head) (Pl. I. N,) - - - -	69
Internal Mammary Vein, (Pl. III. fig. 2,)	68

	Page
Veins of the Thorax.	
Subclavian Vein, with that of opposite Arm, form, Vena Cava Descendens, (joined by) (Pl. I. II. *h*,)	3 & 70
Vena Azygos (formed by) (Pl. I. *t*, IV. dig. 5,)	3 & 15
Lumbar Veins, - - - -	15
Diaphragmatic Veins, - - -	15
Œsophageal Veins, - - -	15
Intercostal Veins, - - -	15
Bronchial Veins, - - - -	15
Vena Cava Descendens, *h*, joins Vena Cava Ascendens, *i*, and forms right Auricle, d, (Pl. I. II.) - - - -	3
Coronary Vein of Heart terminates in right Auricle, (Pl. II. fig. 1, 2, *k*,) -	3
Pulmonary Veins end in left Auricle of the Heart, (Pl. I. dig. 2, Pl. II. III. figs. 1, dig. 1, 2,)	5
Veins of the Pelvis.	
External Iliac Vein, (continuation of Crural Vein, joined by) (Pl. I. V. VI. U,) - - - - -	28
Internal Iliac Vein, (formed by) (Pl. VI. let. x,) - -	28
Internal Pudic Vein, - - - -	32
Hemorrhoidal Vein, - - - -	32
Ischiadic Vein, - - - - -	32
Uterine Vein, - - - - -	32
Obturator Vein, - - - - -	32
Gluteal Vein, - - - - -	32
Sacro-lateral Veins, - - - -	32
Ilio-lumbar Veins, - - - -	32
External and Internal Iliac Veins form *Veins of Abdomen.*	
Common Iliac Vein, (with Vein of opposite side forms) (Pl. V. VI. O,) - - -	28
Vena Cava Ascendens, (joined by) (Pl. VI. V. IV. II. *i*,)	28
Sacro-median Vein,	
Spermatic Veins, (Pl. V.) - - - -	25 & 28
Renal Veins, (Pl. V. L,) - - - - -	24 & 28
Diaphragmatic Veins, (sometimes) - -	25 & 28
Hepatic Veins, (indirectly formed by) (Pl. IV. V. d,)	22 & 28
Vena Portæ, (formed by) Pl. IV. N,) - -	22
Gastric Vein, (Pl. IV. *y*,) - -	19 & 22
Splenic Vein, (Pl. IV. V. *s*,) - - -	19 & 22
Superior Mesenteric Vein, (Pl. IV. U,) - -	21 & 22
Inferior Mesenteric Vein, (Pl. V. H,) - -	21

Nerves.

	Page
Frontal Nerve, (Pl. X.) - - - -	66
Infra-orbitary Nerve, (Pl. IX. dig. 2,) - -	65
Inferior Maxillary Nerve, (Pl. VII. dig. 6,) - -	59
Facial Nerve, (Pl. VIII. IX. dig. 44,) - - -	62
Lingual Nerve, (Pl. VII. VIII. IX. dig. 3,) - -	58
Glosso-Pharyngeal Nerve, (Pl. VII. VIII. dig. 13,) -	57
Accessory Nerve, (Pl. VII. VIII. IX. dig. 12,) -	57
Nervus Vagus in the Neck, (Pl. VII. dig. 1,) - -	51
in the Thorax, (Pl. I. IV. V. dig. 1,) -	10 & 16
in the Abdomen, (Pl. I. dig. 1,) -	19
Great Intercostal Nerve in the Neck, (Pl. VII. I. dig. 7,)	53
in the Thorax, (Pl. IV. V. dig. 7,)	15
in the Abdomen, (Pl. V. VI. dig. 7,)	28
in the Pelvis, (Pl. VI. dig. 7,)	35
Cervical Nerves, (Pl. VII. dig. 21, 22, 23, 24, 9,) -	55
Axillary Plexus of Nerves, (Pl. VII. VIII. IX. dig. 9,)	57
Phrenic Nerve, (Pl. VII. VIII. I. dig. 8,) - -	12 & 56
Intercostal Nerves, (Pl. IV. dig. 9,) - - -	16
Twelfth Dorsal Nerve, (Pl. VI. dig. 3,) - -	36
Lumbar Nerves, (Pl. VI. dig. 6,) - - -	36
Obturator Nerve, (Pl. VI. dig. 21,) - - -	36
Anterior Crural Nerve, (Pl. VI. dig. 22,) - -	37
Sacro-ischiadic Nerve, (Pl. VI. dig. 20,) - -	35
Internal Pudic Nerve, (Pl. VI.) - - -	36

BLOOD-VESSELS AND NERVES

OF

THE TRUNK.

As the blood-vessels and nerves of the trunk are so intimately connected, that they require several views to illustrate them, the reader must bear in mind that the first six plates are blended in the following descriptions. The plates are, however, mentioned along with the letters of reference, as often as found requisite for perspicuity.

In Plate I. we have a representation of the thoracic and abdominal viscera, when the anterior or sternal parietes are removed; the viscera being disturbed as little as possible, in order to exhibit them in their natural position. The letters A are placed on the ribs, truncated near their cartilages, and separated to a considerable extent, which has enlarged the diaphragm B, and brought the greater number of objects into view. The letters C indicate the pericardium or capsule of the heart, that consists of its outer or pleuritic, and inner or proper layer, both of which are serous surfaces united by cellular substance: the pericardium C is laid open to expose the heart D, which is placed between the lobes of the lungs G, G, obliquely in the centre of the thoracic cavity, extending from

BLOOD-VESSELS AND NERVES

OF

THE TRUNK.

As the blood-vessels and nerves of the trunk are so intimately connected, that they require several views to illustrate them, the reader must bear in mind that the first six plates are blended in the following descriptions. The plates are, however, mentioned along with the letters of reference, as often as found requisite for perspicuity.

In Plate I. we have a representation of the thoracic and abdominal viscera, when the anterior or sternal parietes are removed; the viscera being disturbed as little as possible, in order to exhibit them in their natural position. The letters A are placed on the ribs, truncated near their cartilages, and separated to a considerable extent, which has enlarged the diaphragm B, and brought the greater number of objects into view. The letters C indicate the pericardium or capsule of the heart, that consists of its outer or pleuritic, and inner or proper layer, both of which are serous surfaces united by cellular substance: the pericardium C is laid open to expose the heart D, which is placed between the lobes of the lungs G, G, obliquely in the centre of the thoracic cavity, extending from

the second rib of the right side, to the sixth rib of the left side;* and this capsule, which is attached to the diaphragm, to the anterior mediastinum, to the roots of the lungs, and to the large blood-vessels connected with the heart, is reflected and continued over its surface, so that the heart is equivocally said to be without the pericardium: at the points where the pericardium is attached to the large blood-vessels, it forms several angles, named its cornua. The nervous threads, 6, 6, distributed on the pericardium, derive their origin from the great intercostal nerves 7.† The letter D is placed on the right ventricle of the heart;‡ d, on the right auricle;§ *d*, on the left auricle;‖ E, is the aorta,¶ which derives its origin from the left ventricle,** as seen in Plate II., *Fig.* 1, letter *g*; and F indicates the pulmonary artery,†† arising from the right ventricle. The small arteries ramified on the surface of the heart, are the coronary arteries,‡‡ at the side of which are seen the branches of the coronary vein; *r* indicating the right artery; and *s* the

* The situation of the heart, and of all the internal viscera, should be carefully committed to memory, that we may be able to discover them when diseased.

† The attachments of the pericardium should be considered by the practitioner, otherwise he is liable to be deceived in the pulsations of the heart; for that which is felt at the scrobiculus cordis has been mistaken for aneurism of the abdominal aorta.

‡ Named also anterior, or pulmonic.

§ Termed also pulmonic, or anterior, or sinus venosus, or sinus venarum cavarum.

‖ Also styled posterior, or systemic, or sinus venosus, or sinus pulmonalis.

¶ Named also systemic, or systematic artery.

** Denominated also posterior, or systemic, or systematic, or aortic ventricle.

†† Also designated pulmonic.

‡‡ Also termed cardiac. Although these arteries are almost invariably two in number; yet in some cases which have occurred only one has been found, in others three. Where two occur, the one is sometimes larger, and supplies a great portion of the space allotted for the other.

left artery; their further distribution is seen in *Fig.* 1 of Plate II. The white nervous threads encircling the aorta and pulmonary artery, are the cardiac twigs formed by the great intercostal nerves and par vagum.

In Plate II. is seen the minute structure of the heart, and the same letters are applied as in Plate I. *Fig.* 1 represents a posterior view of the heart, injected so as to distend the auricles; *g* indicating the left ventricle; d the right auricle, the proper auricular portion being marked also d, as seen in Plate I.: three veins, the two venæ cavæ and coronary vein, terminate in this latter cavity; the superior or descending vena cava being marked *h*, and its entrance into the right auricle, seen in *Fig.* 2, also marked *h*; and in Plate I. this vein is observed to be formed by the vena azygos *t*, and the two subclavian veins *u v*. The inferior or ascending vena cava is marked *i*; and its entrance, seen also in *Fig.* 2, is marked *i*: this vein is seen in the abdominal cavity, before penetrating the diaphragm in Plates IV. and V., marked likewise *i*. The letters *k* indicate the coronary vein and its branches; and its entrance into the auricle is marked with the same letter in *Fig.* 2, where is likewise seen its delicate valve.

In *Fig.* 2 the right auricle is cut open to show its muscular structure, named musculi pectinati, which delicate bands are best seen in the auricular portion, marked with the letters d. The septum auriculorum is the general flat surface seen in this exposed cavity, having the oval impression l,* nearly in the centre, where the foramen ovale existed in the fetus, which aperture is seen in the fetal heart, *Fig.* 3, marked also l, the membranous valve being wrinkled down;† and the superior portion of the sur-

* Named also fossa ovalis.

† Sometimes the aperture remains pervious in the adult female, rarely in the adult male.

rounding margin, which is thicker, is named isthmus Vieussenii.* Between the two venæ cavæ there is a gentle elevation, or thickening of the parietes of this cavity, marked m, and named tuberculum Loweri, which tubercle is more boldly defined in the quadruped; and at the orifice of the inferior vena cava, is seen the valve of Eustachius n. Over all the internal surface of this cavity are observable small holes, designated after Thebesius, and indicated by little dark spots. The incision is carried downwards, from the auricle to the commencement of the right ventricle, in order to bring into view part of the tricuspid valve,† which is seen in *Fig.* 4, where this cavity is laid open; and the valve marked O in both figures. In this cavity numerous fleshy slips, termed columnæ carneæ,‡ p, p, are observed, and seen to terminate, like muscles in general, in tendons, named chordæ tendineæ, which are inserted either into the membranous part of the valve marked O, or into the opposite side of the cavity; and the whole internal surface of the ventricle is studded with depressions,§ so as to give it a reticulated or honeycomb appearance. The letters q point out the three semilunar‖ valves at the mouth of the pulmonary artery, and their convex surfaces are represented with a small space between them, to show their shape; and in the centre of their loose edges, where they all meet, are three small papillæ, or one in the middle of each membrane, of a redder colour than the rest of the membrane, and generally designated after Arantius.** On the concave aspect of

* Denominated also columnæ foraminis ovalis, and annulus fossæ ovalis.

† Termed also triglochin.

‡ Named also lacertuli, and musculi papillares.

§ Styled also foveæ, pits, or grooves.

‖ Denominated also sigmoid.

** Named also corpusculum Morgagni, corpusculum sesamoideum, and triangular granula.

the valves there are indentations or depressions in the walls or coats of the pulmonary artery, corresponding to the semilunar shape of the valves, named the sinuses of Valsalva; and these form corresponding projections on the outer surface of the artery, that resemble the valves of the veins; two of which projections are seen in Plate I. at F. The pulmonary artery F is seen in *Fig.* 1 to divide into its right and left branches, f, f; the left or shorter proceeding directly to the left lobe of the lungs G of Plate I., and subdividing into innumerable branches: the right or longer branch lies under the arch of the aorta E, and divides also into numerous branches, to be distributed to the right lobe of the lungs G of Plate I. In the fetal heart, *Fig.* 3, the pulmonary artery F, is observed to divide into three branches, f, f, *f*; the two first, marked with the roman character, are the right and left branches which are seen in the adult; the latter, marked with the italic *f*, is the ductus arteriosus, which joins the aorta E at the termination of its arch; and the same wise arrangement of vessels between the heart and lungs is seen in *Fig.* 6. In *Fig.* 1 of Plate II., *d* indicates the left auricle, in which are seen terminating the four pulmonic venous trunks; 1, 1, being the two of the right side; and 2, 2, the two of the left side: the latter are seen in situation on the lung in Plate I. A peculiarity exists in the lungs, that the arteries are more numerous and larger than the veins. The letter *d*, which is more in the shade to the left, is placed on the proper auricular portion of this sinus venosus, and is seen in position in Plate I., where *d* is also placed on the auricular part. This cavity has an appearance internally, similar to that of the right auricle, and has therefore not been represented.

Fig. 5 is a view of the cavity of the left ventricle, which only differs from the right in having thicker and stronger

parietes, and larger columnæ carneæ; those marked *p*, with the membrane *o*, constitute the valvula mitralis, placed between this ventricle and its corresponding left auricle *d*; and numerous other fleshy columns are observed in the inner surface of this cavity, passing in various directions. The letter *g* indicates the septum ventriculorum, which is discovered externally by the left coronary artery *s*, with its accompanying vein, forming a slight groove, as seen in *Figs.* 4 and 2 of this plate, and in Plate I.; while the other or right coronary artery *r*, *Fig.* 1, Plate II., with its accompanying vein, points out the septum, on the dorsal aspect of the heart. The semilunar valves *q*, at the commencement of the aorta E, are precisely similar to those at the mouth of the pulmonary artery F; and at the commencement of the aorta, in two of the cavities or sinuses of Valsalva, the two coronary arteries take their origin. The right one *r*, Plate I., is seen to arise from the aorta, and to proceed between the right auricle and right ventricle, till it reaches the septum ventriculorum, as seen in *Fig.* 1, Plate II., whence descending along the septum near the apex of the heart, anastomoses with the left artery; and in this course, as seen in these figures, gives origin to several branches, some of which anastomose with those of the left artery, while others supply the right auricle, the right ventricle, and also part of the left cavities of the heart and the coats of the vessels. The origin of the left coronary artery *s*, is not observable, but its emergence between the left auricle and left ventricle is seen in *Fig.* 1, Plate II., and its course between the left ventricle and right ventricle in Plate I., where the vessel descends along the septum to unite with the right artery. On reaching the septum ventriculorum, the artery gives off a branch that continues between the two left cavities, and anastomoses with a branch of the artery of the right

side; and this left artery supplies chiefly the left cavities; but they both contribute to supply all the cavities, and frequently anastomose with each other; and they also both contribute to supply the coats of the vessels within the pericardium, and even this membrane itself.

The trachea * K, seen in Plates I., III., and VII., descends beneath or dorsad to the anterior or sternal muscles of the neck, and superficially or dermad to the œsophagus I; and on entering the thorax, the left subclavian vein v extends across it: the trachea then descends to the third dorsal vertebra, and on the right side of, or dextrad to, the arch of the aorta, divides into two branches named bronchi; † the right bronchial tube proceeding directly across, behind or dorsad to the right pulmonary arterial branch the two right pulmonary veins and the vena cava descendens, enters the mass of the right lungs, and subdivides into leaser and lesser branches, which ultimately terminate in the most delicate membranous cells. ‡ The left bronchial tube descends obliquely through or under the arch of the aorta, behind or dorsad to the left pulmonary arterial branch and veins, and enters the substance of the left lungs, subdividing like the right aerial tube. The course of the left before its subdivision is necessarily longer than the right tube, and is seen in Plate IV., marked k, where the lungs are transferred to the right side. In Plate III., *Fig.* 1, a posterior view of the trachea K, and its division into the two bronchi k, k, with a portion of each side of the lungs are represented; and thus the lungs are divided into two portions, but communicating through the medium of the trachea. The smallest bronchial tubes do not terminate in single cells, but in a cluster of delicate membranous cells, that communicate with one ano-

* Named also windpipe, or aspera arteria. † Also termed bronchiæ.
‡ Styled also vesicles, or folliculi.

ther, and form what is termed a lobulus; and around these lobuli, or clusters of cells, are disposed the minute ramifications of the pulmonary artery, which from the elegant and wonderful distribution, are known by the name of the rete mirabile of Malpighi; which structure should be well considered by the practitioner in hemoptysis and pneumonia. These delicate objects cannot be seen in the human lungs, but may be satisfactorily traced in the inferior animals, particularly the amphibiæ, as the turtle, crocodile, and boa constrictor. All that we can observe in the human body, are the segments of the cartilaginous circles of the trachea and bronchial tubes, together with the ligamentous muscular and mucous structures, and the general cellular termination, all of which are displayed in Plates I., III., IV., and VII. In Plate III., *Fig.* 1, the trachea, K, is drawn from its commencement at the cricoid cartilage, to its division into the bronchi k, k, with some of their subdivisions, letters *k*; and these irregular cartilaginous arches are so arranged, that the inferior or sacral easily insinuate themselves within the superior or atlantal, in the motions of the trachea and lungs; and are connected to each other by strong elastic membranous ligaments fixed to their edges, and by short muscular fibres, which are exterior to them, as seen in *Fig.* 1, Plate III., from the inside of the trachea. The trachea and bronchi are completed by a musculo-ligamentous membrane in their dorsal aspect, marked A, and the ligamentous portion is of a bluish tinge; the muscular fibres a, are arranged longitudinally and transversely, and pervade the whole aerial tubes, from the first cartilaginous semicircle of the trachea, to their termination at the cells; the transverse muscular fibres extend between the extremities of the cartilages; and the whole aerial tubes, from the larynx downwards, are lined with a very sensitive and very

vascular mucous membrane, letters c, which is even continuous with the lining membrane of the pharynx and mouth. On the outer surface of the musculo-ligamentous membrane, are observable a number of little mucous glands, as in this figure at A. In the substance of the lungs G, G, a portion of each of which is bisected to show the general cellular or spongy appearance, the letters f indicate the branches of the pulmonary artery, the digits 1 and 2 the branches of the pulmonary veins. Besides the aerial structure, and the arterial and venous arrangement, there exists in the lungs a considerable quantity of delicate cellular substance and glands; the former connecting the lobuli, is termed interlobular substance, and is very loose and thin, forming spongy sheaths to the ramifications of the bronchi and blood-vessels, and ultimately spreading over the outer surface of the lungs, and uniting with the pleura pulmonalis: the latter, or glands, which are more numerous about the roots of the lungs, marked b, are styled bronchial, and are likewise lymphatic; so that there are a number of lymphatic vessels leading from the interlobular substance to these glands. There are also found in the lungs, small arteries, named bronchial, which nourish them, and are seen in Plate IV., marked 3, 3, 3, taking their origin from the thoracic aorta E, * and proceeding to the bronchi, which they accompany through their ramifications: these also supply the pericardium, the coats of the aorta and pulmonary artery, anastomosing with the coronary branches, the pulmonary and œsophageal arteries, and with the pulmonary veins.

* The bronchial, like other small arteries, are very irregular in their origin, arising sometimes from the first intercostal artery, sometimes from one of the œsophageals, and sometimes from the internal mammary, from the inferior thyroideal, and from the subclavian arteries. The bronchial arteries vary from two to five in number.

The bronchial veins generally terminate in the vena azygos and superior intercostal veins: and one of the bronchial veins of the left side is seen in Plate IV., marked 4, terminating in an anomalous vena azygos * 5 of the left side. The nerves which supply the lungs are seen in Plate IV., marked with the digits 2, and are twigs of the par vagum 1; and the plexus which they form is denominated bronchial or pulmonic: † these nervous twigs accompany the bronchi, the pulmonary arteries and veins, and the bronchial arteries, throughout their ramifications. The lungs are invested with a serous membrane, named pleura pulmonalis, as seen in Plates I. and IV., which membrane, proceeding to the roots of the lungs, and surrounding the bronchial tubes and large blood-vessels, is stronger and thicker, and has received the appellation of ligaments of the lungs; where this membrane arrives at their roots posteriorly, the pleura of each side unites by cellular substance, and forms the posterior portion of the mediastinum; ‡ and these layers, in descending to the dorsal vertebræ, are soon separated by the termination of the trachea, the œsophagus, the thoracic aorta, the par vagum, the great intercostal nerves, the vena azygos, the thoracic duct, and several lymphatic glands: these objects, connected or surrounded by loose cellular substance, are contained in a somewhat triangular space, termed the posterior cavity of the mediastinum. The pleura of each side now adheres to the sides of the bodies of the dorsal vertebræ, to the heads of the ribs, and to the intercostal muscles, and extends round, lining

* Sometimes named the demi-azygos. This vein of the left side is not uncommon.

† Likewise the anterior pulmonic plexus, as the nerve of this side runs a little more anterior or sternad than the right. This plexus is sometimes termed the left pulmonic.

‡ Or mediastinum dorsale.

all the parietes of the cavity onwards to the sternum, where the laminæ unite a little to the left of the mesial plane, and form the anterior portion of the mediastinum.* Where this membrane lines the ribs, it is denominated pleura costalis. In the fetus, behind the first bone of the sternum, the thymus gland is situated; and in the adult, when this gland is absorbed, a little cellular substance remains between the laminæ of the pleuræ, before they unite to form the anterior portion of the mediastinum; which space is denominated the anterior cavity of the mediastinum. The mediastinum proceeds dorsad, but is interrupted in its course by the pericardium which it invests, and afterwards by the lungs investing them to their roots, from whence we commenced the description; so that it forms a continuous serous surface, and will probably be more easily understood by stating, that the thoracic cavity and its contents have a shining continuous serous surface, which is named pleura. A painter would comprehend it, were he told that this cavity and its contents were glazed. The diaphragm B, is also invested with the pleura;† and the thoracic cavity on each side is shut up atlantad, by the pleura extending from the aorta along the subclavian artery and vein to the first rib; so that the student in dissecting will find, when the thoracic cavity is opened, that every point he touches is pleura. Both the anterior and posterior portions of the mediastinum are necessarily removed to expose the heart and other viscera; but the posterior cavity may be easily understood, by examining, in Plate IV., the objects situated between the root of the lungs, G, and the sides of the dorsal vertebræ, T. The

* Or mediastinum pectorale.

† This should be denominated pleura diaphragmatica; and where it invests the heart, pleura cardiaca.

right half of the lungs generally consists of three divisions; the left half usually of two, denominated lobes; and these are formed by fissures, or sulci. In the drawing of Plate I. there appear more than three peculiar to the right portion of the lungs, which arises from it being inflated; and the right is shorter and broader than the left, in consequence of the heart lying more to the left than to the right side, and the diaphragm advancing more atlantad on the right than on the left side, owing to the pressure of the liver: the heart occupies a sinus or notch in the left half of the lungs. The conical shape of the lungs, and other peculiarities, are at once seen in Plate I. Their colour in the adult is bluish-grey; in the fetus it is reddish; and in old age purple or livid, with dark spots; but the colour is greatly modified, according to the relative quantity of blood present at different times. From a dead person being commonly placed on his back, the dorsal parts which are dependent are always of a darker tinge.

The other objects observed in the thoracic cavity of Plate I., are the phrenic* nerves, and several blood-vessels. The phrenic nerve, marked 8, is seen also in Plate VII., where it is observed to derive its origin from the cervical nerves in conjunction with the axillary plexus 9, and is generally described as arising from the third and fourth cervical nerves; but this nerve has always a more extensive origin or connexion: in this drawing of the head and neck, the nerve is seen to be connected with all the cervical nerves, and with the great intercostal nerve 7. In some instances the phrenic receives a twig from the hypoglossal nerve 3, and other twigs from the nervus vagus 1. When formed, the phrenic nerve 8 descends on the an-

* Or diaphragmatic.

terior scalenus muscle L, between the subclavian vein x and subclavian artery H, and then enters the thoracic cavity. The left subclavian vein is marked *v*. In this cavity the nerve is only seen on the left side, a very little detached from its connexions, and descends attached to the pericardium C, and is dispersed in a number of twigs on the diaphragm B, even to the inferior crura of the muscle; some of them penetrating this muscle, and uniting with the cœliac and renal plexuses of the splanchnic nerve in the abdominal cavity. The phrenic nerve of the right side, besides forming similar junctions, contributes to supply the liver. The phrenic, like other nerves, or like arteries, give origin to twigs, supplying the objects contiguous to them in their course; and in this manner the scaleni muscles, the thymus gland in the fetus, the pericardium, and the pleura are supplied. The letters M point out the internal jugular veins terminating in the subclavian veins *v*, *u*; the letters N indicate the vertebral veins also ending in the subclavian veins; O is placed on the trunk of the thyroideal veins ending in the left subclavian vein *v*; H, H, indicate the subclavian arteries; P, P, the carotid arteries; Q the arteria innominata; R the vertebral artery; and S the inferior or ascending thyroideal artery. The digits 1 point out the par vagum; 10 indicate their recurrent twigs; 7 the left great intercostal; and 11 one of its cardiac twigs.

Having thus described the heart and lungs, with their blood-vessels and nerves, I shall proceed with the remaining arteries, veins, and nerves of the thoracic cavity. The aorta E, which, as we have seen, commences from the left ventricle of the heart, immediately gives origin to the two coronary arteries *r* and *s*, and makes an elegant curve or arch from the right to the left, and dorsad towards the vertebral column T of Plate IV., along which it descends

a little sinistrad to the mesial line, till arriving at the diaphragm B, through the crura of which the aorta passes into the abdominal cavity. In its course in the thoracic cavity, the aorta is named thoracic; and, from its arch, as seen in Plate IV., there arise three conspicuous branches; the first, marked Q, is the arteria innominata; the second, marked P, is the left carotid artery; and the third, marked H, is the left subclavian artery; the description of which are given in Part III., where they are traced to their destinations, the head and upper extremity. The aorta next gives origin to the bronchial arteries, 3, 3, 3, which have already been described. The œsophageal arteries *b*, *b*, are very irregular, both in their number and distribution, generally varying from two to five; and according to the point of the aorta E, from which they derive their origin, they assist in supplying the contiguous viscera with branches. The intercostal arteries,* marked 12, vary from seven to ten in number, according as the superior intercostal 12,† near the first rib, which is a branch from the subclavian H, supplies more or fewer intercostal spaces, and as one aortic intercostal, supplies one or two spaces; for one artery frequently divides so as to proceed to two ribs. These little arteries are observed to run across the spinal column to the inferior or sacral margins of the different ribs, along which they proceed near the cartilages, where they are lost as continuous tubes.‡ In this course they give origin to small branches that supply the spinal column and canal, the muscles of the back, the intercostal muscles, the ribs, and the pleura, anastomosing with the internal mammary artery 14 of Plate I., and 14 of

* Named also inferior or aortic.

† Also termed intercostalis prima.

‡ The course of the intercostal arteries should be considered in paracentesis thoracis.

Fig. 2, Plate III., and with the thoracics, letters a, of the axillary artery of Plate XI., Part III., and some of them with branches of the diaphragmatic artery, z, of Plate IV., as well as with the epigastric, x, of Plate I. The course of the intercostal veins, 15, is the reverse of the arteries; they are seen terminating in the vena azygos 5, which is observed to pass under the arch of the aorta E, in order to join the azygos *t* of Plate I. of the opposite side, where it ends in the vena cava superior *h* of Plate I. The vena azygos of the left side, when it exists, seldom begins so far sacrad as the vein of the right side; the latter generally collecting the blood of the lumbar veins, and ascending on the right of the aorta on the spinal column, similar to the left one represented in Plate IV., receives the blood of the diaphragmatic, œsophageal, intercostal, and bronchial veins in its course, and terminates in the vena cava superior, as seen in Plate I.

The digits 7., Plate IV., point out the great intercostal or great sympathetic nerve, * which in the neck, before twining round the subclavian artery H, gives origin to the twigs marked 11, that form the cardiac plexus, and unite with the recurrent 10 of the nervus vagus. These twigs are observed surrounding the aorta E, near the beginning of its arch, and descending to its origin from the left ventricle: they are also seen in Plate I. encircling the aorta E and pulmonary artery F; and in the same Plate, one or two twigs are observed surrounding the left subclavian vein d. In the thoracic cavity other twigs are seen to derive their origin from the intercostal nerve 7; the superior or atlantal 14, descending obliquely across the aorta E to the root of the lungs, where they contribute to form the bronchial plexus; the nervous thread, marked 16, forms a junction

* Also named nervus sympathicus.

with the œsophageal plexuses *a*, *a*, of the par vagum, 1, 1; and the remaining twigs which are not marked, are lost on the aorta E. The twigs marked 17 unite to form the splanchnic nerve. The digits 9 indicate the individual intercostal nerves which derive their origin from the spinal marrow, emerge from the foramina common to the vertebræ, accompany the intercostal arteries, and supply with nervous influence the same parts; and their junctions with the great intercostal soon after their commencement are distinctly seen. Two or three of the superior intercostal nerves proceed out of the thorax, penetrate the serratus magnus, which they supply in their course, and extend to the axillary glands, the skin of the axilla, and down along the arm; the longest is named the cutaneous of Wrisberg. These twigs are seen in Part III., Plate XI., of the upper extremity, marked also 9.

The nervus vagus, * of each side, marked 1, is seen in Plate I. descending between the subclavian vein *v* and artery H, to enter the thoracic cavity; and on the left side is seen behind the pericardium. In Plate IV. the nerve is observed descending sinistrad of the arch of the aorta E, and giving origin to its recurrent 10, described in page 52; the trunk then descends on the œsophagus I, but previously gives origin to the pulmonary twigs marked 2, which have been described in page 10. On the œsophagus the nerve divides into a multiplicity of twigs, which unite with those of the opposite nerve, and form the œsophageal plexuses, marked with the letters *a*. † Each nerve afterwards concentrates,

* Styled also pars vaga, and by the ancients the eighth nerve from the base of the brain, although properly the tenth.

† These are improperly named anterior and posterior, as the left nervus vagus descends a little more on the anterior or sternal aspect of the œsophagus than the right nerve.

immediately before emerging from the thoracic cavity, to accompany the œsophagus into the abdomen, and is still marked 1. The nerve of the right side sends its recurrent around the subclavian artery.

I shall now proceed to the contents of the abdominal cavity, and must therefore revert to Plate I. The letters a, indicate the muscular parietes of the abdomen reflected and lined on the left side with the peritoneum *a*; h, h, the great omentum; b, the stomach; c, the duodenum; i, i, the liver; e, the gall bladder; and, f, the broad suspensory ligament of the liver, with its round margin, g, named the round ligament, which formed the umbilical vein in the fetus, as seen in Plate II., *Fig.* 6, and marked also g. The less omentum is the delicate cribriform membrane between the concave arch of the stomach and the liver, where a number of nervous threads are observed expanded on it: F is placed on the spleen; k on the uterus, with *k* on its broad ligament of the left side, and *l*, *l*, on its round ligaments, that of the right side being divested of its peritoneal envelope; m indicates the urinary bladder, partially distended, and partly covered with the peritoneum *a*, which is here observed to terminate, and to be reflected on the abdominal muscles.

The arteries seen in this view of the abdominal cavity, are chiefly the branches of the cœliac, which is generally the second from the abdominal aorta, as seen in Plates V. and VI., where the aorta is marked e, and the cœliac n. This artery, therefore, takes its origin immediately as the aorta passes through the diaphragm, and becomes abdominal; and, after little or no course, divides into three branches, the gastric p, the hepatic q, and the splenic r. The relation of the cœliac artery to the stomach, liver, and pancreas, is satisfactorily seen by comparing Plates I.

and IV. In Plate I. the gastric,* p, is observed to sweep round the lesser and concave arch of the stomach b, and to give origin to a number of small branches, which extend across to the great arch, and anastomose with the branches of the arteria gastro-epiploica dextra, s, and sinistra w. The gastric also gives origin to other small branches, that supply the less omentum and contiguous parts, and which anastomose with the diaphragmatic artery, and vasa brevia of the splenic artery. The hepatic artery q, extends dextrad to the liver, i, and divides into the right and left branches to supply the same lobes of the viscus; each branch ultimately subdividing into very minute ones, in order to nourish the organ. The trunk of the hepatic in this course generally gives origin to the arteria gastro-epiploica dextra, s,† which, running dorsad of the duodenum, c, sends off branches to the duodenum and pancreas; the branch, s, then runs along the convex arch of the stomach, b, and inosculates with the gastro-epiploica sinistra, w, of the splenic artery. As the dextra emerges from under the duodenum, and extends along the arch of the stomach, it gives origin to a number of branches, which supply the epiploon or omentum majus h, and also to branches ramified on the stomach. The hepatic artery, on entering the liver, sends off a branch to the gall bladder, e, that usually proceeds from the right hepatic branch, as seen in Plate IV.

The commencement of the third branch r, of the cœliac artery, is observed in Plate I., and its course and distribution in Plate IV., where it runs under the pancreas D for some distance to the left, and emerges accompanied with its vein *s*, extending a little further, to be distributed in

* Named also coronaria ventriculi, and gastrica superior.

† Also named gastrica dextra, and gastrica inferior dextra.

the substance of the spleen F. This splenic branch in its course, dorsad or under the pancreas, supplies to this viscus a multiplicity of small branches, named pancreatics; and beyond the spleen several branches are observed, some distributed on part of the omentum majus h; one truncated and marked w, which is the arteria gastro-epiploica sinistra,* seen in Plate I.; and others arising from the concave arch of this last, and ramified on the stomach, named vasa brevia. The veins observed to accompany the gastric and splenic branches of the cœliac artery, assist in forming the vena portæ N, seen in Plate IV.

The letter T in Plate I. indicates the external iliac artery, with its accompanying vein U, divested of the peritoneum *a*, and giving origin to the epigastric artery X, which is also observed accompanied with its vein *x*, and both of which latter are on the pubic side of the round ligament *l*.

The nerves seen in this view, Plate I., of the abdomen, are twigs of the right nervus vagus 1, which are minutely distributed on the stomach and omentum minus, sending twigs along the hepatic artery q, to contribute to the formation of the hepatic plexus; and also twigs of the cœliac plexus, indicated by the digits 3, and distributed on the omentum majus h, which different nervous threads are observed to proceed chiefly along the arteries.

In Plate IV. there is a further developement of the arteries and veins of the abdomen, the stomach being removed, and the liver more elevated to display its vessels: the same letters are placed as in Plate I.; k indicates the lobulus spigelii; *e*, the ductus cysticus; *f*, the ductus hepaticus; and *g*, the ductus communis coledochus; c is the duodenum, the continuation of which is represented by dotted lines; K the beginning of the jejunum,

* Also named gastrica sinistra, and gastrica inferior sinistra.

and L the termination of the ileum, and between these two last a long coil of intestine is observed; M is the caput cæcum coli; 29 the appendix vermiformis; O the the ascending portion of the colon; P the transverse arch of the colon; Q the peritoneum or mesentery covering the duodenum Ç, and supporting the small intestines, and the superior mesenteric artery R and vein U. The superior mesenteric artery R,* generally the third branch of the abdominal aorta, is hid at the point where it arises, by the pancreas D, and the transverse arch of the colon P, in the duplicature of the mesentery of which intestine the artery runs for a short distance; but its origin is distinctly seen in Plates V. and VI. The artery, on emerging from beneath the colon, as seen in Plate IV., runs superficially, or sternad to the duodenum, enters the mesentery, and forms a concave arch towards the ascending portion of the colon, and a convex arch towards the small intestines. From the concave arch, the superior mesenteric generally gives origin to branches that supply the termination of the ileum and the one half of the colon, which are named the ileo-colica *t*, the colica dextra *u*, and the colica media *v*; but these are irregular in number. From its convexity arise a multiplicity of small branches, forming elegant arches, that become smaller as they approach the jejunum and ileum between K and L, which distribution is seen in Plate V., where the intestines are removed, and where the letters R indicate the trunk of the superior mesenteric artery; but the vessel is here out of situation. This artery supplies also the pancreas and duodenum, and the branches proceeding to them anastomose with those of the cœliac. The colica media *v* inosculates with the colica sinistra *a* of the inferior mesenteric artery b, in Plate V., which inoscula-

* Named also arteria mesenterica major.

tion is termed the great mesenteric arch.* The letter U indicates the superior mesenteric vein.

Having thus described the veins which contribute to form the vena portæ N, excepting the inferior mesenteric, I shall now trace this vein and its artery, beginning with the latter. The inferior mesenteric artery,† seen only in Plates V. and VI., marked b, takes its origin near the termination of the aorta e, enters the duplicature of the mesocolon, supplying the left portion or sigmoid flexure of the colon *z* and rectum I. Its first branch, named colica sinistra, is marked *a*, and anastomoses with the colica media *v*, seen in Plate IV., in order to form the great mesenteric arch: several other branches are perceived proceeding to the colon, while the continuation of the trunk *b* descends along the rectum I, to the sphincter ani, and assumes the name of internal hemorrhoidal, seen in Part III., Plate XIV. The veins observed to accompany this artery ultimately concentrate, so as to form the large one marked H, named, after the artery, the inferior mesenteric vein,‡ which is seen ascending, and running dorsad of the superior mesenteric artery R, to join the splenic vein *s*; the united trunk being cut off, to bring the nerves into view. In Plate IV. the splenic vein *s* is traced from the spleen F by dotted lines, running beneath the pancreas D, to the vena portæ N, which is also represented by dotted lines, running beneath the pancreas, where it is joined by the superior mesenteric vein U, under the colon P. The superior mesenteric vein U,‖ collecting the

* The profuse arterial distribution to the intestines is a point of consideration for the physiologist and practitioner, in regard to the mucous secretion, and to enteritis, hernia, and several other diseases.

† Styled also arteria mesenterica minor.

‡ Named also inferior mesariac, or hæmorrhoidalis interna.

‖ Termed also vena mesaraica major.

blood from the right half of the large, and from all the small intestines, is observed to form the greater portion of the vena portæ* N; and a number of smaller veins are perceived to rise from the colon and duodenum, the latter of which is sometimes termed vena duodenalis, and to terminate in this vein. Immediately atlantad to the termination of the splenic vein *s*, may be seen the junction of the gastric vein† *y*, represented by dotted lines running beneath the pancreas D. These different veins constitute the vena portæ ventralis;‡ but a number of others join them, as, for instance, several from the pancreas; indeed, all the veins which return the blood circulated by the cœliac, the superior and the inferior mesenteric arteries, with the exception of the hepatic, contribute to form the vena portæ, and the branches of the veins are named after the branches of the arteries. These veins have no valves. Where the vena portæ advances to the liver i, and acquires an adventitious covering of the peritoneum, or the capsule of Glisson, it is termed vena portæ hepatica; and immediately divides into two large branches, *n*, *n*, one to each lobe, which ultimately subdivides into innumerable branches. The hepatic veins d return not only the blood circulated by the hepatic artery in the liver, but also that portion of the blood not converted into bile, which is furnished by the vena portæ; they are very numerous in their commencement in the liver, and previously to emering from that organ generally concentrate into three large and five small trunks, which shortly join the vena cava ascendens *i*, before it passes through the diaphragm B. One of these hepatic veins is seen in Plate IV., and another in Plate V.

* Named also vena portarum.

† Styled also vena coronarii ventriculi.

‡ Denominated also abdominalis.

The first branch to which the abdominal aorta gives origin is the diaphragmatic artery,* z, Plates IV., V., and VI., which ascends directly atlantad on the concave surface of the muscle B, extending its branches onwards to the sternum, inosculating with the internal mammary artery, and towards the ribs also with the intercostals. Sometimes, as in this instance, the artery is single, sometimes double; sometimes it is a direct branch from the aorta, at other times a branch from the cœliac artery n; indeed, like all small arteries, they are very irregular. The second branch from this portion of the aorta, we have seen to be the cœliac n of Plate VI.; the third branch, the superior mesenteric R of Plates IV., V., and VI.; the fourth branch, the renal artery† c, seen only in Plates V. and VI., which takes its origin from the side of the aorta e, and proceeds almost directly across to the kidney Y, the concave arch of which it enters, and subdivides round the commencement of the ureter F, or pelvis of the kidney; giving origin to branches that supply the supra-renal gland G, and the tunics of the kidney. The renal artery of the right is longer than that of the left side, in consequence of the aorta descending more on the left side of the mesial line of the spinal column. This artery is very irregular with regard to its origin; for, in some instances, four branches proceed from the aorta to one kidney; and in rare cases, one trunk supplies both kidneys. Sometimes the renal artery gives origin to the spermatic artery g, Plates V. and VI.; here, however, the latter comes off as a direct branch from the aorta, and may be generally considered the fifth branch of the abdominal aorta. The spermatic artery *g* descends, on the right side, superficially to the vena cava ascendens *i*, and ureter F, f, rests on the

* Styled also phrenic.

† Named also emulgent.

psoas magnus muscle K, crosses the external iliac artery T, dips into the pelvic cavity, and enters the broad ligament *b* of the uterus k, near the ovarium N, and in this course lies dorsad to the peritoneum to which it adheres. This artery sends its branches outwards along the broad ligament *k*, to the round ligament *l*, which it contributes to form, and ultimately passes out of the abdomen by the inguinal canal, and is lost on the pubes and groin. The artery proceeding in this long serpentine path, sends branches to the ureter and other parts, and anastomoses with branches of the lumbar and other arteries. In the male, the artery takes the same course, but forms more inosculations at its origin, in consequence of the testis having been contiguous to the kidney in the fetus; and in its descent along the spermatic cord differs from the female; which difference is explained in Part III. The spermatic artery arises sometimes from the renal, sometimes from one of the lumbar, sometimes from the common iliac, sometimes from the internal iliac, and sometimes from the epigastric arteries.* The lumbar arteries, which are given off laterally throughout nearly the whole extent of the abdominal aorta e, are generally five in number on each side, and are observed in Plate VI., where only four, marked t, are discernible. They proceed directly across to the abdominal muscles, supplying the vertebral column in their course, and anastomosing with branches of the internal mammary, epigastric, and circumflex iliac.

Many of the veins which return the blood circulated by the branches of the abdominal aorta, have already been described; the lumbar veins contribute to form the vena

* The course of the spermatic plexus should be kept in view when throwing a ligature round either the external or internal iliac artery in the living body.

azygos; and the gastric, splenic, superior, and inferior mesenteric, with several smaller veins, to form the vena portæ. The renal vein of each side is seen in Plate V., marked L; the left being the longer, and both ending in the vena cava ascendens *i*. The diaphragmatic veins accompany their arteries, and end either in the vena azygos, or in the vena cava ascendens dorsad to the liver; but are too trifling for representation. The spermatic veins are two in number; on the right side they are observed to arrange themselves one on each side of the artery *g*, and to terminate in the vena cava ascendens *i*; the veins of this side more commonly join the ascending cava nearer the renal vein; while those of the left side usually end in the renal vein of the same side. An anomalous vein, which returns the blood from the surface of the psoas magnus and psoas parvus M muscles, is observed immediately above their termination, and is truncated.

* In Plate V., the abdominal aorta e is observed to divide about the second last lumbar vertebra into two large branches, named common iliacs, P, P;† and into a third and very small branch which arises at this bifurcation, seen only in Plate VI., marked *p*, and termed sacro-median. Each common iliac artery P‡ descends to the brim

* Should the abdominal aorta become the seat of operation, an incision must be made parallel to the linea alba on the left of the umbilicus, sufficiently extensive to enable the surgeon to keep aside the small intestines, which are to be transferred to the right side, while he dissects or scratches cautiously the peritoneum interposed between him and the artery. The aneurismal needle should be inserted between the vena cava ascendens and the aorta, and be turned round from right to left. Plates I., IV., and V., illustrate the anatomy of this operation. The superior and inferior mesenteric arteries and their veins must be kept in view. The patient before the operation should have a brisk cathartic to empty the intestines.

† Termed also the lumbar portions of the crural arteries.

‡ To secure the common iliac artery P, the operator must calculate its course from the second last lumbar vertebra to its emergence from the abdomen, in the

of the pelvis, and near the sacro-iliac synchondrosis divides into the external iliac T* and internal iliac V† arteries; but they are a little displaced, in order to bring into view their accompanying veins and the trunk of the sympathetic nerve. They are more distinctly seen in Plate VI. The external iliac artery T‡ with its accompanying vein U, on its inner or mesial and sacral side, runs along the brim of the pel-

centre between the anterior superior spinous process of the os ilium and the spine of the os pubis. An incision proportionate to the depth is then to be made in the course of the fibres of the external oblique muscle, making the centre of it opposite to the spinous process of the os ilium. The external incisions must extend through the integuments and the three lateral abdominal muscles, to the peritoneum, which is then to be carefully separated with the fingers from the iliacus internus and psoas muscles, the operator keeping in view the spermatic plexus and ureter, till he feels the pulsation of the artery. The artery can be distinguished from the external and internal iliacs only by feeling the pulsations of the three. The aneurismal needle or that of Mr. Weiss should be passed round the artery from the pelvic to the iliac or outer side, in order to avoid the vein. The artery should be tied as near as possible to its division into the two iliacs, that a clot of blood may be formed. The reasons why the incision should be made so far iliad, are, in order to avoid the spermatic cord and the epigastric artery, and because the peritoneum is more easily separated from the muscles.

* Named also the iliac portion of the crural artery, and likewise iliaca antica or externa.

† Styled also the hypogastric, or hypo-iliac, or iliaca interna, or iliaca posterior.

‡ When the external iliac artery becomes the seat of operation, the surgeon has to calculate its course like that of the common iliac. It invariably emerges out of the abdomen, at five and a half parts from the spine of the os pubis, and four and a half parts from the spine of the os ilium. Keeping in view this course, the incisions should be the same as in the operation for the common iliac, in order to avoid the spermatic cord, and to be able to separate the peritoneum from the iliacus internus and psoas muscles. The latter muscle is generally a guide to the artery, and should be relaxed when throwing the ligature round the vessel. In several subjects, particularly female, I have observed this artery dipping very deep by the side of this muscle into the pelvis. The artery should be secured as far from the internal iliac as to ensure the formation of a clot of blood, and as far from the disease as to ensure the vessel sound. The needle should be passed round the artery from the pelvic to the iliac or outer side, in order to avoid the vein. The spermatic plexus and ureter ought to be kept in view.

vis, attached to the inner or mesial margin of the psoas magnus muscle κ; and as the artery advances to the parietes of the abdomen, rests on the muscle, and proceeds along with it out of the cavity; but immediately before its emergence generally gives origin to the epigastric artery x, and the circumflex iliac branch *c*. The course of the epigastric artery x, Plates V. and I., is beneath and internal, or sacrad and pubic to the round ligament of the female, or the spermatic cord of the male, and afterwards upwards or atlantad between the peritoneum *a* and the abdominal muscles; and a little above, enters the sheath of the rectus muscle, in the fibres of which it ascends about one-third from the linea alba, and two-thirds from the linea semilunaris, and ultimately anastomoses in the epigastric region with the internal mammary artery 14, as represented in Part IV., Plate II.; and inosculating in this progress also with the circumflex iliac *c*, the ilio-lumbar, y, of Plate V., and the lumbars t of Plate VI.* In this course the epigastric sends off a number of branches; but the most important is that which descends along the spermatic cord out of the inguinal canal, and which is seen in Part III., Plate XV., marked *x*. The circumflex iliac artery† *c*, Plate V., with its accompanying vein, proceeds within the abdominal cavity, between the junction of the abdominal muscles to the psoas κ and iliacus internus w muscles, and near the anterior superior spinous process of the os ilium runs between the transversalis abdominis and the obliquus internus abdominis, where these muscles are attached to the crista of the os

* The course of the epigastric artery should be carefully attended to in operating for strangulated inguinal or femoral hernia, for the cæsarian section, for the extirpation of tumours in the abdominal cavity, and for paracentesis abdominis.

† Named also abdominalis Halleri; by Boyer, iliaca antica; by Shaarshmid, the iliaca externa minor.

ilium, as seen in Part IV., Plate III.; its branches advancing to anastomose with the last intercostals, the lumbars, and the ilio-lumbar of the internal iliac; and some inosculating also with branches of the epigastric and of the internal mammary arteries. In its course the circumflex iliac sends branches to the inguinal glands, and sometimes to the pubes and spermatic cord, and the muscles in its neighbourhood. This artery is occasionally a conjoint branch with the epigastric artery.*

The external iliac vein U is the trunk of the veins of the inferior extremity, and is observed to receive the circumflex iliac and epigastric veins on entering the abdomen; and as it proceeds on the inner side of its artery T, to be joined by the internal iliac vein X, which, however, is seen only in Plate VI. These constitute the common iliac vein O, which forms, with the vein of the other side, the vena cava ascendens *i*, that ascends on the right of the aorta e, receiving in its course the spermatic, renal, hepatic, and diaphragmatic veins; and immediately after passing through the right aperture of the diaphragm, enters the pericardium, and unites with the superior cava to form the right auricle of the heart. In Plate IV. the inferior cava *i* is seen to pass along the dorsal margin of the liver, where it receives the hepatic veins d, and forms a sulcus in this viscus.

Having thus finished the description of the arteries and veins of the abdominal cavity, I shall now proceed to the examination of the nerves; the par vagum were traced to their destination, and therefore the great intercostal nerves

* The branches which anastomose with the epigastric are sometimes so large as to prevent the performance of paracentesis abdominis between the umbilicus and anterior superior spinous process of the os ilium, as represented in Part IV., Plate III.

remain only to be examined. In Plate IV., the great intercostal nerve,* marked 7, descending in the thoracic cavity, gives origin to a number of twigs, marked with the digits 17, which form the splanchnic nerve, better seen in Plate V.; and this nerve, on piercing the muscular fibres of the diaphragm B, becomes enlarged, which is styled the semilunar ganglion *a*; and from the ganglion of each side, are sent off a multiplicity of nervous threads, that unite across the aorta e, so as to form the great solar plexus. Where this plexus encircles the cœliac artery, which is immediately contiguous, it is termed the cœliac plexus; and this nervous mesh receives an addition from the left nervus vagus 1. On the right side, the twigs running along and twining around the hepatic artery, q, are named the hepatic plexus; and on the left side, the twigs encircling the splenic artery r, are termed the splenic plexus: in Plate IV. these nervous threads are seen to accompany the splenic artery to the spleen r, sending twigs over and around the pancreas, D; and to accompany the hepatic artery onwards to the liver, i. Some twigs are observed to accompany the gastric artery, p, to form the gastric plexus; others, which supply the omentum majus and arteria gastro-epiploica dextra, are observed in Plate I., and described in page 20. In Plate V., ganglia, marked with the digits 8, are observed situated sacrad to the roots of the hepatic and splenic arteries, q, r, and are generally considered as portions of the solar plexus: from these, nervous threads proceed to the root of the superior mesenteric artery R, where they appear to accumulate, are named the superior mesenteric plexus, and are circumflected along the artery and its branches, onwards to the

* Named also nervus sympathicus, vel sympatheticus.

intestines.* Other nervous threads are seen encircling the renal artery c, and forming small ganglia, which constitute the renal plexus of nerves, and accompany the artery c and vein L, to the kidney Y; some twigs proceed to the gland G, some encircle the vena cava *i*, and others the ureter F. From the superior mesenteric and renal plexuses, and from the nervous threads uniting them on the surface of the aorta, arise a number of twigs which, after surrounding the left renal vein L, descend on the aorta e, to its division into the two common iliac arteries P, P; and in this progress twigs are observed to accompany the spermatic arteries *g*, *g*, named the spermatic plexuses, which twigs are joined by others proceeding from the trunk of the great intercostal 7. That plexus on the right side is seen to accompany the artery *g* to the ovarium N, where it is lost on the broad ligament of the uterus. These nervous threads of the splanchnic are also observed to form a plexus on the inferior mesenteric artery b, which they accompany to its distribution on the colon *z*, and rectum I; this plexus, like the others, is named after the artery on which it is distributed: other threads are observed to descend on the inferior mesenteric vein H, to assist in forming this inferior mesenteric plexus. Twigs are also seen to proceed from the left intercostal trunk 7, to run beneath the vein H, and to join the spermatic, and the inferior mesenteric plexuses. The leash of nerves on the aorta e, is formed in a considerable measure by the trunks of the great intercostal nerves; those deriving their origin from the right 7, are distinctly seen. On the left common iliac artery P, there is a con-

* This multiplied distribution of the nerves on the intestines should be well considered by the practitioner in cases of enteritis and other intestinal affections.

spicuous ganglion 9, formed chiefly by the trunk of the left great intercostal nerve; and the twigs which emanate, unite with the nerves descending on the aorta, and constitute what is termed the hypogastric or the most inferior of the mesenteric plexuses; and from this mesh, nervous threads are observed to descend into the pelvis, supplying the termination of the colon z, and the rectum I, the ureter f, the uterus k, the bladder m, and the common iliac artery P, with its divisions T and V; all which are more distinctly seen in Plate VI.

The trunk of the sympathetic nerve 7, after giving origin to the splanchnic twigs 17, descends on the sides of the bodies of the lowest dorsal vertebræ, and pierces the muscular structure of the diaphragm B, as seen in Plates IV. and V.; and in the latter, is observed on the right side descending dorsad to the hepatic artery q, and appearing between it and the renal artery c, where the nerve generally gives origin to twigs that contribute to form the renal plexus. The trunk 7 then descends dorsad to the renal artery c, and vein L, and appears on the side of the aorta, between it and the vena cava ascendens *i*, beneath which the nerve proceeds, and is again seen descending on the sacrum into the pelvis. In this course the nerve forms junctions with the individual lumbar nerve 6, similar to what it does with the individual intercostal nerves in the thorax; and these junctions have an oblong ganglifform appearance, distinctly seen in Plate VI.: this nerve also gives origin to a multiplicity of nervous threads, which run over the aorta, where they partly unite with the twigs of the opposite nerve, partly with those of the splanchnic, and partly with the spermatic plexus, all of which are seen in Plate V.

Before tracing either the trunk of the great intercostal nerve, or the splanchnic twigs, into the pelvis, it will be

necessary to take notice of the viscera and blood-vessels of this cavity. Plate VI. is a representation of these objects by a section of the pelvis: A is the symphysis pubis; B the sacrum, where it united with the os ilium in forming the sacro-iliac-synchondrosis, the os innominatum of the left side having been therefore removed; and b, the body of the sacrum, kept lighter in the drawing than it should be, to show the nerves and arteries. The letters I indicate the rectum descending on the sacrum; k, the fundus of the uterus, the broad and round ligaments having been removed, to exhibit the nerves and blood-vessels; D, the vagina; and m, the urinary bladder, the dotted lines leading from this viscus to the external iliac artery T, on the left side, indicating the course of the ureter. The letters F are placed on the bodies of the lumbar vertebræ; K, on part of the psoas magnus muscle, the greater portion being removed to bring into view the lumbar nerves; and W, on part of the iliacus internus muscle, a considerable portion being removed, to show the sacrum B.

The aorta and its branches have been described as far as the internal iliac artery v, and sacro-median *p*. The latter, or sacro-median *p*, derives its origin from the aorta in the angle formed by its division into the two common iliacs P, P; descends sacrad on the body of the sacrum b, to the common iliac vein o, and terminates generally near the extremity of the os coccygis; giving off small lateral branches, that anastomose with the sacro-laterals, *a*, *a*, of the internal iliac, and supplying the sacrum, coccyx, and rectum. Neither the sacro-median vein, nor the veins accompanying the branches of the internal iliac artery, have been drawn, in order to render the arteries as distinct as possible; and these arteries have generally each one vena comes, but sometimes two, like other small arteries: in general, all smaller arteries have this pecu-

larity with regard to the accompanying veins, while the larger arteries have only one vein. These veins of the pelvis have generally valves, as represented in *Fig.* 8, Plate III.

The internal iliac artery v* descending into the pelvis along the sacro-iliac-synchondrosis to the great sacro-ischiadic notch, divides into a number of branches, the ilio-lumbar y,† seen in Plate V.; the sacro-laterals, *a*, *a*; the gluteal *c*;‡ the obturator *d*; the uterine *e*; the ischiadic *f*; the hemorrhoidal *g*; and the internal pudic *h*,§ seen in this Plate VI.

The *ilio-lumbar*, y, Plate V., is a small branch which runs beneath the psoæ muscles M, K, supplying them in its course, and anastomosing with the lumbar arteries, t, Plate VI., and with the circumflex iliac, *c*, Plate V., where it supplies the iliacus internus muscle, w, and transversus abdominis. The ilio-lumbar is sometimes a branch of the common iliac. The sacro-lateral branches, *a*, *a*, which are very small, run along the body of the sacrum b, unite with the sacro-median *p*, and supply the bone, its canal, the cauda equina, and nerves. The gluteal *c*, which is the largest branch, proceeds immediately through the greater sacro-ischiadic notch out of the pelvis, as described in Part III. The ischiadic *f*, is the second largest branch, and sometimes with the gluteal gives origin to all the others,

* When a ligature is required to be thrown round the internal iliac artery, the same directions as those given for securing the common iliac are applicable. The psoas magnus muscle becomes an excellent guide to the artery in this, as in the operation for securing the external iliac artery. The internal iliac vein lies mesial to the artery, as seen in Plate VI., therefore the needle should be passed round the artery from the pelvic to the abdominal aspect, or from the pelvis to the psoas muscle.

† Named also iliaca parva.

‡ Styled also iliaca postica.

§ Termed also pudica pelviena, pudenda, pudenda communis, pudenda circumflexa, pudenda interna, pudenda media, and pudenda externa.

and is observed in this plate to branch off along with the internal pudic and hemorrhoidal on the left side, while on the right side only with the pudic; such is the irregularity in the origin of all small arteries. This artery *f*, descends a little further into the pelvis than the gluteal, but also emerges at the same notch out of the pelvis, being only separated by the pyriformis muscle and great sacro-ischiadic nerve 20, which is described in Part III. In this subject the artery passed between the portions of the nerve. The obturator artery *d*, is seen in its natural course only on the right side, for on the left, it is truncated and thrown out of situation by the removal of the os innominatum: on the right, the artery is observed to run on the parietes of the pelvic cavity, along with the obturator nerve 21, and to make its exit at the obturator foramen.

The uterine artery *e*, descends between the uterus k, and rectum I, and terminates in the neck and body of the uterus; in this progress generally giving origin to branches that supply the urinary bladder, named vesical, and which are sometimes considered regular branches of the internal iliac. The uterine arteries anastomose with each other, and with the spermatics, and both of these pairs enlarge to a great size in pregnancy and diseases of the viscus; and their accompanying veins still more so: the right spermatic vein at parturition may be compared to the vena cava ascendens. The hemorrhoidal artery *g*, named generally the middle hemorrhoidal, descends by the side of the rectum I, onwards to the sphincter ani, giving origin to branches that supply the gut and urinary bladder; the continuation of the inferior mesenteric being the internal, which is here seen truncated where the rectum commences. The internal pudic artery *h*, of the female differs in its distribution from that of the male, which

is described in Part III. In both sexes, the artery descends out of the pelvis, along with the gluteal and ischiadic arteries, at the greater sacro-ischiadic notch, but at its most distal or ischiadic margin, twines round the short sacro-ischiadic ligament, re-enters the pelvis between the two ligaments, then ascends along the tuberosity of the os ischium, ramus of the ischium, and pubes. In this course, in the female, the pudic gives origin to a number of branches that supply the rectum and vagina with its appendages, and also the muscles and ligaments; and generally anastomoses with the internal circumflex, obturator, and external pudic arteries. A conspicuous branch *r*, proceeds to the rectum, and is termed the external hemorrhoidal.

The condensed membrane, in the form of a cord, marked *n*, was the umbilical artery in the fetus, and in the adult generally remains pervious for a short extent, and gives origin to a vesical branch: this cord is observed to ascend to the fundus of the bladder, along which it runs to the linea alba, and, lastly, to the umbilicus. In the fetus the umbilical artery *n*, of *Fig.* 6, Plate II., is the largest branch of the abdominal aorta e, and naturally pursues the same course as in the adult: the two arteries *n*, *n*, are observed to twine round the umbilical vein g, and conjointly to constitute the umbilical cord which at its other extremity is attached to the placenta of the mother. As these arteries proceed towards the pelvis, they are seen to give origin to very small branches, which become those large arteries already described in the adult.

The nerves of the pelvis are seen in Plate VI. The mesh of nerves on the termination of the aorta e, described in page 31, are observed to unite with the nerves from the ganglion 9 on the left common iliac artery, and to descend into the pelvis, forming junctions with the twigs

of the trunk of the great intercostal nerve, with the inferior mesenteric nerve, (the latter of which is represented truncated with the artery of the same name and the rectum I), and forming junctions with the great sacro-ischiadic nerve 20, and supplying the viscera and blood-vessels of the cavity.

The trunk of the great intercostal nerve 7, has been described in page 31, as far as its entrance into the pelvis. In Plate VI., this nerve is only seen on the right side in this cavity, descending on the side of the body of the sacrum b, and giving origin to a number of twigs that unite with the sacral nerves, the splanchnic, and twigs of the opposite nerve: the two trunks ultimately form a small ganglion on the os coccygis, named ganglion impar. The nerve marked 20 is the great sacro-ischiadic, formed by the two inferior lumbar and the three superior sacral nerves. The nerve which is seen accompanying the internal pudic artery *h* throughout its course, is the internal pudic, and generally derives its origin both in the female and male from the second and third sacral nerves, forming junctions with the great sacro-ischiadic, the trunk of the great intercostal, and the splanchnic nerves.

The lumbar nerves, marked with the digits 6, are five in number; the inferior or sacral not being brought into view. The nerve marked 3 is the last dorsal. The two superior lumbar are generally distributed on the abdominal and dorsal muscles, while the three inferior supply chiefly the lower extremity. In the preceding Plate V., several twigs are seen emerging below the psoas magnus muscle K, running on the iliacus internus muscle W, and quadratus lumborum muscle C, and supplying these muscles in their course onwards to the lateral muscles of the abdomen and the peritoneum; some of them, as the third, run beneath Paupart's ligament, down the thigh, as

described in Part III.; others, as the second, a twig of which is observed descending on the psoas parvus muscle M, passes out of the abdomen at the inguinal canal, and accompanies the round ligament in the female to the pubes, and even descends to the labia. In Plate VI. the lumbar nerves are seen to send twigs to the great intercostal, as already explained, and also along the external iliac artery T. The nerve marked 21 is the obturator, and derives its origin generally from the third and fourth lumbars, descends on the inner or mesial side of the psoas magnus muscle, which it supplies, into the pelvis, and proceeds in company with the obturator artery *d*, as seen on the right side, to the obturator foramen: its distribution is explained in Part III. The muscle has been removed, excepting that portion marked K, in order to bring into view the nerves which run in its muscular structure. The digits 22 mark the anterior crural nerve,* which is commonly formed by twigs of the four superior lumbar nerves, and descends in the body of the psoas muscle,† emerging at its outer or iliac side, and approaching nearer the external iliac artery T, with which it proceeds out of the abdomen, resting on the iliacus internus muscle; and in its course giving origin to twigs that supply these muscles and the artery: the further distribution of this nerve is detailed in Part III. The posterior twigs of the sacral, lumbar, dorsal, and cervical, nerves, are much smaller, and of less importance than the anterior; they supply chiefly the muscles and skin.

* Named also simply the crural nerve, and likewise the anterior femoral nerve.

† The multiplicity of nerves which pierce the fibres of the psoas muscle, and their destination, should be considered in psoas or lumbar abscess.

BLOOD-VESSELS AND NERVES

OF THE

HEAD AND NECK.

I SHALL now proceed to the blood-vessels and nerves of the head and neck, although it would have been more natural and consecutive to have traced those of the pelvis to their distribution in the lower extremity; but this I have been prevented doing, from the impossibility of procuring a subject, for upwards of five months, from which to make the drawings of the leg.

Plate VII. The arteria innominata* *Q*, seen in Plate IV., is the first branch which derives its origin from the arch of the aorta E, after emerging beyond the pericardium; and in Plate I. is observed to ascend by the side of the trachea K, where the artery is obscured by the left subclavian vein *v*, extending across it, and at the upper extremity of the sternum divides into the right subclavian artery H, and the right carotid artery P. In Plate VII. the artery is seen ascending by the side of the trachea K, but obscured by the inferior thyroideal veins, letters O; in Plate VIII. it is hid by the sterno-thyroideus muscle B; in Plate IX. by the sterno-hyoideus muscle C, and the sterno-cleido-mastoideus muscle E, with one of the external jugular veins D; and in Plate X. by the platysma myoides muscle F.† In Plate VII., the common carotid

* Termed also anonyma.

† In operating, therefore, to throw a ligature around the arteria innominata, the object of greatest moment to be avoided is the left subclavian vein *v*, seen in Plate I. There is no nerve of consequence on the artery, but merely a small twig 4 of the nervus vagus 1 in Plate VII, descending to the heart; and this is not always pre-

P* is observed to ascend on the bodies of the cervical vertebræ, by the side of the œsophagus and pharynx, and the trachea K, the thyroid gland Z, the cricoid N, and thyroid S, cartilages; and opposite to the space between the latter cartilage and os hyoides X, to divide into the external a, and internal, 19, carotid arteries. In this course the common carotid has the nervus vagus, 1, on its outer or lateral and dorsal aspect, the internal jugular vein, M, Plate VIII, still more on the outer, or on the lateral and sternal aspect, but somewhat superficially, and the descendens noni nerve 5, quite superficially, or on the sternal aspect. The sterno-thyroideus muscle B crosses obliquely

sent. The patient should recline on a bed or sofa, with the head hanging a little over, and the face turned to the right, to relax the sterno-cleido-mastoideus muscle E, and to render the artery as shallow as possible. An incision of some length, regulated by the muscularity and fatness as well as the age of the individual, is to be made through the skin and cellular substance, along the tracheal edge of the right sterno-cleido-mastoideus muscle, avoiding as much as possible the branch of the external jugular vein D. The second incision may be more limited, and should divide the fibres of the sterno-hyoideus C, and sterno-thyroideus B, muscles. The knife should now be laid aside. The operator will feel first the pulsation of the common carotid artery P; then, by retracing it to its origin, he will feel the pulsation of the right subclavian; and lastly, that of the arteria innominata, around which a ligature may be easily thrown by means of Weiss' aneurismal needle. The knot formed by the ligature does not seem to have been attended to; the ends of the thread should run parallel to each other, like the reef-knot of the sailor, or the common knot of the weaver. After this operation, as well as all others for securing large arteries, the patient should be confined for several days in bed, in the horizontal posture; for the least excitement of the heart and arteries disturbs the adhesive inflammation, and produces secondary hemorrhage. This cause appears to have prevented the success of Dr. Mott and Dr. Gräfe's operations. In this operation, some of the inferior thyroideal veins O, as well as the external jugular branch D, may be wounded; and when this occurs, they should be tied at both orifices; although it is an axiom in surgery not to tie the veins, yet these are so contiguous to large veins as to endanger life if not secured. The left subclavian vein *v*, may be considerably diminished in its calibre, by putting a tourniquet round the left arm, and compressing the left internal jugular vein.

* Named also arteria cephalica.

over its lower portion, and also the sterno-hyoideus muscle c, and omo-hyoideus muscle u, of Plate IX.; while the sterno-cleido-mastoideus muscle x runs superficially parallel to the artery, and in some measure hides the vessel. The external jugular branch d lies superficially throughout.* The internal carotid artery† 19, ascends close on the vertebræ, deeper and somewhat occipital, or inial to the external carotid, and at the basis of the cranium enters the canalis carotideus (*t*, *Fig.* 2, Plate IV., Part I.) to contribute to supply the brain. This artery will be described in the Part which treats of that organ. The external carotid artery‡ G, immediately on separating from the internal, gives origin to several branches, which

* To secure the common carotid artery r, the patient should be placed on a bed, sofa, or table, with the face turned to the side opposite to that on which the operation is to be performed, in order to remove the sterno-cleido-mastoideus muscle as much out of the way as possible, and thus to enlarge the space for operating. A line should be drawn across from between the thyroid and cricoid cartilages to the margin of the muscle, as there the artery is most exposed and most easily reached. An incision of some extent, depending on the same grounds as mentioned under the directions given for the arteria innominata, should be made through the skin and cellular substance, along the tracheal margin of the sterno-cleido-mastoideus x, and a deeper incision through the platysma myoides r, Plate X., carefully avoiding the branch of the external jugular vein d. The fibres of the sterno-cleido-mastoideus will then be felt, when the knife may be laid aside, and the artery separated from the internal jugular vein m, the nervus vagus l, and descendens noni δ, either with the aneurismal needle, the handle of the knife, or the fingers, and the ligature passed round the artery. As they are not connected with very condensed cellular substance, this may be easily accomplished. The laryngeal veins z, seen in Plates VIII. and IX., are very liable to be wounded when the scalpel is used to denude the artery. The needle should be passed from the vein and nerve round the artery to the trachea; the scalpel lateralized with the cutting edge to the trachea; and the vein compressed above the wound. Lymphatic glands sometimes occur in the way of the knife, and embarrass the operator. The point of the artery here selected must depend on circumstances, for the vessel may be required to be secured lower down; in which case, the directions given for the above and the arteria innominata both require to be considered.

† Named also arteria encephalica.

‡ Also termed arteria pericephalica.

are far from being regular; in general, they are eight in number, the superior or descending thyroideal *a*; the lingual *b*; the facial *c*; the occipital *d*; the posterior auris *e*; the internal maxillary *f*; the temporal *g*; and the ascending pharyngeal *h*; all of which are seen partly in this Plate, and partly in Plates VIII., IX., and X. The temporal *g* is commonly considered the trunk or continuation of the external carotid, so that the direction of the artery is upwards or atlantad to the angle of the inferior maxillary bone, as seen in Plate IX., where all the parts are undisturbed, having the lingual nerve 3, with its branch the descendens noni 5, several lymphatic glands v,* and the posterior head of the digastric and stylo-hyoideus w muscles,† superficially to it; also the platysma myoides muscle r, with the common integuments, and sometimes branches of the external jugular vein, as seen in Plate X.; the external carotid artery continuing its course behind the angle and ramus of the inferior maxillary bone, runs superficially to the zygomatic process of the temporal bone 20, assumes the name of temporal, and branches over the cranium.‡

* These lymphatic glands are very subject to disease, particularly in the scrofulous habit. When they become indurated and so enlarged as to prove troublesome or dangerous, they require extirpation. Here the operator has to consider their close proximity to so many important vessels, that after making free external incisions, and arriving at the base of the tumour, the handle of the knife or the fingers only should be employed. The surgeon, before operating, should carefully consider also the effect of the platysma myoides, and cellular sheath beneath it, in binding down these tumours of the neck, otherwise he will find himself deceived when he comes to operate; for what often appears a small tumour before operation, is found to have extensive ramifications among these important objects.

† These two muscles are so intimately connected, that the letter w refers to both.

‡ From the depth of the external carotid artery, and the nerves and veins in its contiguity, no attempt should be made to secure the artery when wounded; but the common carotid should be tied at the place formerly directed.

The first branch of the external carotid is the superior thyroideal artery* *a*, which descends obliquely downwards under the omo-hyoideus and sterno-thyroideus muscles to the larynx, and is distributed chiefly on the thyroid gland &c.† In this course the thyroid gives off one or more branches; a laryngeal, which runs between the os hyoides x and thyroid cartilage s; another to the thyroid cartilage; and a third proceeding backwards across the common carotid r to the sterno-cleido-mastoideus muscle E. The muscles beneath which this thyroid artery runs, and supplies, are readily understood on comparing the Plates; as, for example, branches to the inferior constrictor of the pharynx Y, the thyro-hyoideus z, the crico-thyroideus a, and other muscles of the larynx and vicinity. The thyroid anastomoses with its fellow of the opposite side, and with the inferior thyroid artery s of the subclavian; and is accompanied by veins, that ultimately form the vein T, generally termed laryngeal, and which joins the internal jugular vein M. The superior thyroid is sometimes as large as the external carotid, so as to form a third branch of the common carotid artery.

The second branch *b* is the lingual artery, that runs beneath the hyo-glossus muscle *i*, a few fibres of which are cut open to show the artery as represented in Plate VII., immediately above, or atlantad to the os hyoides x; beneath this muscle the artery proceeds onwards, and enters the fibres of the genio-hyo-glossus *k*, running along

* Named also descendens, and atlanto-thyroidea.

† The thyroid gland has now been so often successfully extirpated, that the operator should make himself well acquainted with the situation of the thyroideal arteries and veins, for on the prevention of the loss of blood depends the success of the operation. The other thyroideal arteries s, and veins o, branches of the subclavians, require to be secured; and the important trunks of arteries, veins, and nerves in the vicinity must be kept in view.

the base of the tongue to its tip; and in this course supplying the muscles through which it passes, and those contiguous, as the genio-hyoideus *l*, the mylo-hyoideus *m*, the middle constrictor of the pharynx, the stylo-hyoideus, and others; and also the os hyoides x.* Its sublingual branch, improperly so named, is the one which proceeds to the symphysis menti, as seen in Plate VII.; and the termination of the artery, which runs by the side of the frænum linguæ, is sometimes termed arteria ranina.†

The next branch is the facial *c*,‡ which ascends by the side of the pharynx *p*, beneath the posterior head of the digastric and stylo-hyoideus muscles w, to the submaxillary gland *n*, between the lobes of which the artery runs to the base of the inferior maxillary bone, over which it ascends on the face, beneath the platysma myoides r, and the depressor anguli oris muscle b, to the angle of the mouth, then under the zygomaticus major a, and zygomaticus minor e muscles, resting on the buccinator muscle h, along the upper lip, and ala of the nose, to the inner canthus of the eye, where it anastomoses with the nasal branch of the ophthalmic artery of the internal carotid.§

* This branch is named by Haller the ramus hyoideus.

† The artery at this point requires to be guarded against in dividing the frænum linguæ in children. Where the artery runs atlantad to the os hyoides, it requires sometimes to be secured in extirpating the tongue when cancerous; and in throwing a ligature round the artery, the operator must keep in view the lingual nerve 8, which is sometimes very close to the artery.

‡ Named also labial, angular, and external maxillary.

§ When this artery requires to be secured, it may be easily found by dividing the space between the angle of the inferior maxillary bone and its symphysis into three proportional parts. The artery runs over the bone one third from the angle, and two from the symphysis.—(*MS. Lectures of Mr. Walker, formerly Lecturer on Anatomy and Physiology, Edinburgh.*) The facial vein z lies superficially to the artery. The facial artery throughout its course should be considered in relation to operations and wounds of the face.

In this course the artery gives origin to several branches; a palatine that supplies the tongue, the velum palati, the tonsils, the Eustachian tube, and several muscles, as the stylo-hyoideus, stylo-pharyngæus k, stylo-glossus m, and pterygoideus internus n; numerous branches to the submaxillary gland *n*; and a branch to the hyo-glossus muscle *i*: also other branches to the tongue and its muscles, to the lining membrane of the mouth, and to the upper part of the pharynx. The second conspicuous branch is the submental or submaxillary, seen to run on the mylo-hyoideus muscle *m*, beneath the anterior head of the digastric muscle, onwards to the symphysis of the chin; which branch sometimes takes its origin directly from the external carotid c. In Plate IX. there is a large lymphatic gland over this branch, between the submaxillary gland and anterior head of the digastric muscle. After its appearance on the inferior maxillary bone, the artery sends off branches to the depressor anguli oris muscle b, to the masseter muscle l, and the buccinator muscle h; and near the angle of the mouth, gives origin to the coronary branch of the lower lip, which is hid at its commencement by the depressor anguli oris. The coronary of the upper lip is observed to take its origin a little above the angle of the mouth,* and to meander in the fibres of the orbicularis oris muscle f, which both it and the trunk supply. Branches also are sent to the zygomatici, the levator labii superioris alæque nasi i, the levator anguli oris o, the compressor naris n, muscles, and the inside of the nostrils.

The occipital *d* was the fourth branch enumerated. This artery takes its origin from the posterior or dorso-

* The coronary arteries should be considered with relation to the operation for hare-lip, or cancer of the lip.

lateral aspect of the carotid G, and ascends obliquely over the internal jugular vein M, and beneath the sterno-cleido-mastoideus E and accessory nerve 12 of the nervus vagus, to the temporal bone, in a groove of which it runs (as seen in Plate V., *Fig.* 7, letter *n*, of Part I.) to the occipital bone, which the artery also imprints (as seen in the same Plate, *Fig.* 5, letter *e*, of Part I.); and after running beneath the sterno-cleido-mastoideus, the trachelo-mastoideus, the digastric, and splenius capitis p, muscles, parallel to their insertions, the artery ascends the occipital bone, between the first of these muscles and the insertion of the trapezius muscle, onwards to the coronal suture, where it inosculates with the branches of the temporal *g*. In this course the occipital artery is observed to give off numerous branches: one along the internal jugular vein M, which it accompanies into the cranium, and anastomoses with the meningeal arteries; some to the lymphatic glands v, and the muscles in the neighbourhood; one that inosculates with the vertebral artery;* some to the ear, and which anastomose with the posterior auris *e*; and others, and these the principal, to the occipito-frontalis muscle q, the periosteum, the other integuments of the cranium, and also to the bones themselves. Some of these latter pierce the lambdoidal suture, and supply the dura mater. This artery, in some cases, takes its origin from the internal carotid. I have a cast where it is the continuation of the deep cervical *r* of the inferior thyroideal s of the subclavian artery. I showed the subject to that able anatomist Dr. Barclay.

* From this inosculation of the occipital and vertebral arteries, the occipital should be a preferable vessel to the temporal artery for abstracting blood in phrenitis, and other similar affections of the head. Of this the ancients seem to have been aware.

The posterior auris, or auricular branch *e*,* ascends, like the occipital, obliquely backwards, through the substance of the parotid gland, to the back part of the cartilage of the ear, on which it is chiefly distributed; sending off branches to inosculate with the occipital and temporal; and supplying also the various muscles of the external ear, as the attollens aurem r, and the parotid gland s. This artery sends a particular branch into the foramen stylo-mastoideum (seen in Part I., Plate V., *Fig.* 7, letter *f*), named the stylo-mastoid, which gives origin to branches that supply the mastoid cells, and other portions of the middle ear, anastomosing with the internal auditory branch of the vertebral. The auricular is frequently a branch of the occipital.†

The internal maxillary branch *f*‡ takes its origin, like the facial, from the anterior aspect of the external carotid artery G, proceeds behind the ramus of the inferior maxillary bone 25, and near the neck of the condyloid process, ascends between the pterygoideus internus muscle n and pterygoideus externus muscle t, to the bulbous process of the superior maxillary bone, and at the spheno-maxillary fissure (seen in Part I., Plate IV., letter R), enters the infra-orbitary canal, along which the artery runs, and emerges on the face at the infra-orbitary foramen *o* along with the infra-orbitary nerve 2, where it anastomoses with the facial, the temporal, and ophthalmic arteries, supplying the muscles of the upper lip, the gums, alveolar processes, and teeth. In this course the internal maxillary gives origin to numerous small branches; some to the articulation of the inferior maxillary bone, which also enter the

* Named also auricularis posterior.

† The posterior auris is the only artery that should be cut in dividing the facial nerve when attacked with neuralgia.

‡ Also named orbito-maxillary.

tympanum by the fissure of Glasserus; some to the temporal muscle u; and one named inferior maxillary * v, that enters the osseous canal of the inferior maxillary bone along with the nervus mandibulo-labialis 4, as seen in Plate VII., where the bone is represented by dotted lines. Before entering the canal, this branch sends off a small branch to accompany the twig of the nerve, both of which assist to make the groove in the bone (as seen in Part I., Plate VII., *Fig.* 25, letter *s*). In the canal of the bone the artery supplies the respective teeth, and lastly emerges at the foramen mentale *f* with the nerve, supplying the muscles of the lower lip, as the depressor labii inferioris 70, and anastomosing with the facial artery. A branch enters the cranium at the foramen ovale (seen in Part I., Plate IV., *Fig.* 2, digit 4), where the inferior maxillary nerve 6 comes out; and a conspicuous branch 5, named the meningeal, is observed to run basilad to the inferior maxillary nerve 6, to enter the cranium by the foramen spinosum of the sphenoid bone (seen in Part I. Plate IV. *Fig.* 2, digit 5). Its buccal branch is seen in Plate VIII., ramified on the buccinator muscle h. A pterygo-palatine branch runs down through the canal (marked *s*, *Figs.* 16 and 22, Plate VI., Part I.), along the palate to the foramen incisivum, where it sends a branch upwards to the nostrils, and in this course supplies the velum, tonsils, and palate. A spheno-palatine branch runs through the foramen (o, of *Fig.* 4, Plate IV., Part I.), and is ramified on the nostrils. Its pharyngeal branch is seen in Plate VII. descending on the pharynx downwards to the hyo-glossus muscle *i*. The trunk of the internal maxillary, as it runs along the infra-orbitary canal, sends branches to the antrum maxillare and orbit.

* Termed also genio-maxillary. It is this branch only which should be wounded in dividing the nerve 4 for neuralgia.

The ascending pharyngeal *h* * is a very small branch, ascends on the pharynx *p* upwards to the base of the cranium, supplying the constrictors and mucous membrane of the pharynx, the muscles on the forepart of the bodies of the cervical vertebræ, the muscles of the velum palati, the velum itself, and the tonsils; and a small branch accompanies the internal jugular vein M into the cranium.

The temporal branch *g*, the continuation of the trunk, ascends imbedded in the parotid gland, s, to the zygomatic process 20 of the temporal bone, over which it runs, and immediately divides into an anterior and posterior branch, that lie imbedded in the tendinous expanse of the occipito-frontalis muscle † q, q, as they advance to the crown of the head, where the posterior inosculates with the occipital and posterior auris, while the anterior branch inosculates with the frontal branch 91 of the ophthalmic artery, and both with the arteries of the opposite side. In this ascent the temporal artery gives origin to a number of branches; some to nourish the parotid gland; some to the articular depression, which enter the tympanum by the fissure of Glasserus; branches to the auricle, the temporal muscle, and meatus auditorius externus; some to

* Denominated also simply pharyngeal.

† When the temporal artery is to be opened for fever, &c., the lancet should be used first as a scalpel, by making an oblique incision downwards, and secondly upwards, or in the manner in which it is commonly employed in opening a vein; for the integuments, and the transverse fibres of the tendinous expanse of the occipito-frontalis, are too tough to be cut at once, as in phlebotomy. To use both a scalpel and a lancet, alarms the patient, protracts his pain, and is not so adapted for the purpose as the lancet alone. Generally one of the branches of the artery is taken, but this depends on circumstances. When the artery is wounded, and there is much tumefaction, or in any case when its pulsation cannot be felt, it can invariably be found by measuring between the anterior part of the concha of the external ear, and the posterior margin of the superior orbitar process of the os malæ, and dividing this space into six proportional parts; the artery running over the zygoma, one part from the concha, and five from the os malæ.—*MS. Lectures of Mr. Walker, formerly Lecturer on Anatomy and Physiology.*

supply the masseter muscle; a branch named transversalis faciei, which extends across the masseter in company with a conspicuous twig of the facial nerve, immediately above or coronad to the parotid duct x, to supply the upper lip, the side of the nose, and the orbicularis palpebrarum w.

The veins which return the blood circulated by the external carotid artery, are generally named after the branches of this artery. The temporal vein y is observed to commence about the centre of the coronal suture, and to descend to the trunk of the temporal artery *g* at the zygoma, which it then accompanies through the substance of the parotid gland, s, to the angle of the inferior maxillary bone, where the vein assumes the name of external jugular D, and is generally joined by the facial vein z.* The temporal vein receives in its course a number of branches corresponding to those of the artery, and anastomoses with the frontal branch *z* of the facial z, with the temporal of the opposite side, and with the occipital vein 90. From the angle of the inferior maxillary bone the external jugular vein D descends beneath the platysma myoides F, obliquely across the sterno-cleido-mastoideus E, near the origin of the muscle, where, passing beneath, it joins the subclavian vein *u*. In this course it communicates with the anterior external jugular vein D, the continuation of the facial z.†

The facial vein z is formed by the frontal branch *z* that returns the blood circulated by the frontal artery 91,

* The distribution of the veins here displayed I have found to be as frequently the case as any other; and as this inculcates more practical lessons to the operator, I have preferred them.

† The posterior external jugular vein, crossing obliquely over the sterno-cleido-mastoideus, is opened in apoplexy, &c. In performing this simple operation, the lancet should be used first as a scalpel, and then as a lancet in phlebotomy at the bend of the arm; for the vein is either beneath the fibres of the platysma myoides, or interwoven in them.

descends in the fibres of the orbicularis palpebrarum w, at the inner angle of the eye, where assuming the name of facial, receives a multiplicity of branches as it descends superficially to the levator labii superioris i, and the zygomaticus minor e, and beneath the zygomaticus major a, along the margin of the masseter l, to the base of the inferior maxillary bone, where the vein accompanies the facial artery *c*, keeping superficially to the latter. The facial vein then separates from the artery, and continues to descend beneath the platysma myoides F, and superficially to the submaxillary gland *n*, and either unites with the temporal vein y to form the external jugular vein; or continues its course downwards to the tracheal edge of the sterno-cleido-mastoideus E, along which the vein runs nearly to the origin of the muscle, where it dips beneath, and terminates in the subclavian vein *u*. In its descent from the inferior maxillary bone, this vein is observed to receive veins from the muscles extended between this bone and the os hyoides x, and one from the gland *n*; also to communicate with the other external jugular vein, and to receive one branch from beneath the sterno-cleido-mastoideus, and another from the larynx which descends obliquely over the sterno-hyoideus c. This venous trunk may be considered the anterior jugular vein, and the other described in the preceding page the posterior jugular vein, although a vein which sometimes descends superficially, nearly in the mesial line of the neck, is termed the anterior external jugular. Like the smaller arteries, there is great irregularity in the distribution of these subcutaneous veins; thus, the facial, and many of those on the neck, sometimes end in the internal jugular vein.

The occipital vein 90 collects the blood circulated by the occipital artery *d*, anastomoses with the temporal vein y, and descends on the occiput imbedded in the fibres of

the posterior head of the occipito-frontalis q, in those of the sterno-cleido-mastoideus, and splenius capitis, and joins either the internal jugular or vertebral vein: in the subject from which the drawing was taken, it terminated in the latter. Sometimes branches of the occipital end also in the external jugular vein.

The internal jugular vein M, which collects nearly all the blood circulated within the cranium by the internal carotid and vertebral arteries, (the sources of which will be described in the Part on the brain), emerges along with the glosso-pharyngeal nerve, the nervus vagus, and the accessory nerve, at the foramen lacerum posterius (seen in Part I., Plate IV., *Fig.* 2, letter w), and descends in the neck on the outside, or the dorso-laterad, of the internal carotid artery 19, afterwards on the common carotid P, beneath the sterno-cleido-mastoideus muscle E, downwards to the subclavian vein *u*, in which it terminates. In this course the internal jugular receives the internal maxillary veins, the pharyngeal veins, one or two occipital veins, the lingual vein, and the superior laryngeal veins T; and a number of cervical veins end in the angle where the internal and subclavian veins meet.

As portions of the great intercostal nerve and nervus vagus have already been described, with them therefore I shall commence. The nervus vagus 1, on its emergence from the cranium at the foramen lacerum posterius, (seen in Part I., Plate IV., letter w), along with the internal jugular vein M, its accessory nerve 12, the glosso-pharyngeal nerve 13, gives and receives twigs from these two nerves, as well as the lingual 3, and great intercostal nerve 7, seen in Plate VII; and at this part the nervus vagus sends a number of soft branches to the internal jugular vein, then descends in the neck between this vein and the internal carotid, and afterwards the common carotid artery,

giving twigs to those arteries in its progress downwards to the subclavian artery, between which and the subclavian vein the nerve enters the thoracic cavity. In this course the nervus vagus first gives origin to two or three small pharyngeal twigs, which are seen in Plate VII. ramified on the upper part of the pharynx, immediately above and below the glosso-pharyngeal nerve 13; and these pharyngeal twigs are generally joined by twigs from the accessory nerve. The superior laryngeal nerve 55 descends behind the internal carotid artery, and in Plate VIII. is observed to cross the origins of the facial *c* and lingual *b* arteries, and to divide into a superficial, and a deep twig; the former advancing to the hyo-thyroideus z, and sometimes supplying many of the superficial muscles in the neighbourhood; the latter or the deep twig, proceeding to the interior of the larynx, supplies the mucous membrane, and nearly all the little muscles of this organ. The laryngeal nerve 55 entering the larynx between the os hyoides x and thyroid cartilage s, is better seen in Plate VII., where the superficial is removed. Another twig 4 is perceived arising nearly opposite to the letter s on the inferior thyroideal artery, and descending on the carotid artery P to the heart: its distribution, along with that of the great intercostal nerves, is seen in Plate I. on the aorta E and pulmonary artery F. The nervus vagus 1, on entering the thorax, gives off a recurrent twig 10,* distinctly seen in Plate I. to run round the subclavian artery on the right, but on the left side, to turn round the arch of the aorta E, which is more distinctly observed in Plate IV. This recurrent 10 at its origin frequently sends off twigs to the pulmonic plexus, and afterwards ascends by the sides

* Also named nervus laryngeus inferior. This nerve is sometimes double on the right side; and in one case found deficient.—*Dr. Stedman in Edinburgh Medical and Surgical Journal*, No. 77.

of the trachea κ and œsophagus, to the space between the thyroid gland and larynx, where it sends twigs to the gland, to the œsophagus, the pharynx, the trachea, the mucous membrane of the larynx, and to several of its small muscles. In its ascent the recurrent unites with the cardiac twigs 11 of the great intercostal 7, so as to contribute to the formation of the cardiac plexus, which junction is distinctly seen in Plates I. and IV. The continuation of the nervus vagus has been described in page 16.

The great intercostal nerve 7, which is formed by reflected twigs of the 6th pair, and the vidian nerve of the 5th pair (all which will be explained in the Part on the organs of sense), emerges from the cranium at the canalis carotideus (seen in Part I., Plate IV., *Fig.* 2, letter *t*), where the internal carotid artery 19 enters, and descends in the neck on the sides of the bodies of the vertebræ, bound down by loose cellular membrane, till it arrives at the inferior thyroideal artery s: in this course forming several junctions, and giving origin to some twigs. At its emergence from the canalis carotideus, the great intercostal nerve becomes enlarged, which increase is named its first cervical ganglion, and at this point forms junctions with the glosso-pharyngeal nerve 13, with the lingual nerve 3, with the nervus vagus 1, and with the first cervical nerve 21. The ganglion 7, the nervus vagus 1, and the internal carotid artery 19, are encircled with loose cellular membrane; and from this ganglion a number of soft twigs proceed along the artery, which sometimes receives also twigs from the nervus vagus: these soft twigs frequently extend to the external carotid artery G. The trunk of the intercostal 7 is observed to unite posteriorly with the different cervical nerves, particularly the four superior, which are marked 21, 22, 23, 24. From the

tracheal aspect the intercostal gives origin to some twigs, nearly opposite the third cervical nerve 23, which unite, descend behind the internal carotid 19, and appear between the common carotid P and the superior thyroideal *a* arteries, between which this twig continues its course to the thyroid gland Z. Another twig is given off by the intercostal immediately below the second digit 7, nearly opposite the third cervical nerve 23, which descends behind the carotid artery P, supplying the artery in its course, and generally sending a number of twigs to the muscles on the anterior part of the trachea, and forming junctions with the recurrent 10 of the nervus vagus 1, and ultimately distributed on the aorta E: this is sometimes named the superior superficial nerve of the heart. Where the trunk of the nerve twines round the inferior thyroideal artery s, another ganglion is commonly formed, which is named the inferior cervical ganglion. Sometimes a third cervical ganglion is found about the fifth or sixth cervical vertebra; indeed, more irregularity occurs in this nerve than in any other, and if the student find the trunk of the nerve in its regular place, he need not be surprised should he find more or less ganglia and twigs proceeding to every nerve, and to every other object in the neck. From the inferior cervical ganglion, named also the cardiac, the twigs generally proceed that constitute the deep or proper cardiac nerves, marked 11 in Plates VII., I., and IV., which twigs unite with the recurrent 10 of the nervus vagus 1, with the superficial cardiac nerve, and with other twigs of the nervus vagus, as that marked 4, Plate VII., and form an extensive cardiac plexus, that supplies the lungs, the heart, and its vessels. Many of them are seen in Plates I. and IV.

The trunk of the great intercostal nerve, after dividing and uniting beneath the artery s, descends on the verte-

bral artery R, of Plate I., on which the nerve sometimes forms a plexus, and again divides at the subclavian H, as represented in Plate IV., where the nerve unites in the thorax, near the head of the first rib, to form the first thoracic ganglion. The continuation of the nerve has been described in page 15.

The individual cervical nerves 21, 22, 23, 24, and 9, derive their origin from the spinal cord; like the dorsal and lumbar, they emerge from between the vertebræ, and are distributed chiefly on the muscles and integuments of the neck, excepting the four inferior, marked 9, which constitute the nerves of the upper extremity. They consist of anterior and posterior branches, like the other spinal nerves; but the former only are represented, as they are more important; the latter or posterior supplying merely the muscles and integuments on the back part of the neck. The first nerve 21 is observed to form a beautiful plexus with the commencement of the great intercostal 7, and to unite both directly and indirectly with the second nerve 22, indirectly through the medium of the intercostal. This anterior portion 21 of the first cervical nerve sends twigs to the vertebral artery and rectus lateralis muscle, twigs to the recti antici muscles, and a twig to the lingual nerve 3.

The anterior branch 22 of the second cervical nerve unites with the first cervical, with the ganglion 7 of the great intercostal, and with the third cervical nerve, and gives origin to a twig which descends on the internal jugular vein M, forming a junction with the descendens noni 5, as seen in Plate VIII., where it is also observed to send a twig to join the nervus accessorius 12. This twig, however, is formed by the posterior branch of the nerve, which in this case, contrary to the general arrangement, is the larger of the two, and joins the posterior branches

of the first and third cervical nerves, and then pierces the muscles, as, for example, the complexus and the splenius capitis. In Plate IX. this nerve is seen to emerge from beneath the sterno-cleido-mastoideus E, and to proceed along the posterior margin of the muscle to the occiput, dividing into two twigs in its course. This is named the greater occipital nerve.

The anterior portion 23 of the third cervical nerve is observed in Plate VII. to form connexions with the preceding and the succeeding nerve 24, and with the great intercostal 7, and also contributes to form the phrenic nerve 8, as explained in page 12; this nerve likewise assists in forming the bond of union with the descendens noni on the internal jugular vein, as seen in Plate VIII. In Plate IX. there are two nervous twigs observed to emerge from the posterior margin of the sterno-cleido-mastoideus, and to ascend towards the anterior margin, beneath which they run; the more superior or coronal of the two sending a small branch to the ear; the inferior or sacral, named the less occipital nerve, passing under the sterno-cleido-mastoideus, and emerging on its outer or occipital margin, to accompany the occipital artery *d*. In Plate IX., where these twigs commence, a small one is observed given off by the more sacral of the two, that extends across the sterno-cleido-mastoideus to the external jugular vein D, along which the twig sometimes descends to the sternum. The third cervical nerve unites also with the accessory 12.

The anterior part 24 of the fourth cervical nerve contributes to form the phrenic 8, and joins the preceding, the succeeding, and the great intercostal nerves, and gives origin to a multiplicity of twigs, that descend to the clavicle A, as seen in Plates VIII. and IX., and which, from their course and situation, are subdivided into superclavicular, supra-clavicular, and sub-clavicular.

The remaining cervical nerves unite with the first dorsal, emerge between the scalenus anticus L and scalenus posticus, 50, muscles, and form the axillary plexus 9, described in Part III. In Plate IX. two twigs may be observed crossing obliquely over the subclavian artery H; the smaller, descending nearly parallel to the external jugular vein, is one of the thoracic nerves; the larger constitutes one of the brachial nerves.

The nervus ad par vagum accessorius 12* is formed within the vertebral canal by twigs arising from the roots of the posterior portions of the fourth, fifth, sixth, and seventh cervical nerves, ascends to the foramen magnum (seen in Part I., Plate V., *Fig.* 5, letter *k*), through which it enters the cranium, and proceeds to the nervus vagus, along with which, the glosso-pharyngeal, and internal jugular vein, the nerve makes its exit at the foramen lacerum posterius (seen in Part I., Plate IV., *Fig.* 2, letter w.) Immediately before its emergence, the nerve generally gives origin to a branch termed interior, which joins the twigs of the nervus vagus to form the pharyngeal nerves; and this interior branch sends also a twig to the lingual nerve 3, and one to the nervus vagus 1. The exterior branch of the accessory descends obliquely backwards superficially to the internal jugular vein M, perforates the sterno-cleido-mastoideus muscle E, where, uniting with the second cervical nerve 22, it continues its course along the levator scapulæ 40 to the trapezius muscle 80; and in this extent gives origin to twigs supplying these different muscles, and forming junctions with the third cervical nerve 23, and also with the fourth, 24.

The glosso-pharyngeal nerve 13 emerges at the same foramen with the last nerve and nervus vagus, and imme-

* Also named accessory nerve of Willis.

diately swells into a small ganglion, sending twigs to the facial nerve, to the nervus vagus 1, to the internal jugular vein M, and to the internal carotid artery 19, and forming a plexus with the soft twigs of the great intercostal 7 and nervus vagus 1: the nerve then descends behind the stylo-hyoideus muscle w, giving origin to twigs that supply the stylo-pharyngeus k, and the constrictors of the pharynx *p*; and lastly sends off its lingual twig, which, descending sometimes before and sometimes behind the stylo-glossus muscle m and hyo-glossus *i*, to which it affords twigs, enters the root of the tongue, supplying the lingualis muscle 60, and the genio-hyo-glossus *k*, in its course to the papillæ capitatæ vel lenticulares of the tongue. Its pharyngeal twig unites with a twig of the nervus vagus, and forms a plexus that is distributed on the carotid artery, the middle and inferior constrictor muscles of the pharynx.

The lingual nerve 3* emerges at the foramen condyloideum anterius of the os occipitis (seen in Part I., Plate IV., *Fig.* 3, letter *p*), receives twigs from the nervus vagus, its accessory, and from the first cervical nerve, then descends between the internal jugular vein M and the internal carotid 19 to the occipital artery *d*, round which it turns, and proceeds directly across to the tongue. Where the nerve turns round the occipital artery, it gives origin to the descendens noni 5, which has generally two roots, one of them being either from the nervus vagus, or this nerve and the great intercostal conjointly. The branch 5 descends on the common carotid artery P† downwards to

* Also named the hypo-glossal, or the middle lingual, or the ninth, or the twelfth of the cerebral nerves.

† The situation of this nerve should be attended to by the operator when securing the common carotid artery.

the sternum, giving origin to twigs to the sterno-hyoideus muscle c, the omo-hyoideus muscle u, the sterno-thyroideus muscle b, and the thyro-hyoideus muscle z; and unites on the internal jugular vein m with the second 22, third 23, and fourth 24 cervical nerves, as well as with the diaphragmatic nerve 8.

The trunk of the lingual nerve, after giving origin to the descendens noni, proceeds beneath the pharyngeal veins, and superficially to the facial *c* and lingual *b** arteries, near the margin of the hyo-glossus *i*, where it sends off twigs to this muscle, to the thyro-hyoideus, and to the sterno-hyoideus: the nerve then runs between the hyo-glossus and the mylo-hyoideus *m*, supplying them with twigs that extend onwards to the genio-hyoideus *l*, the genio-hyo-glossus *k*, and the lingualis 60; the nerve afterwards forms junctions with that of the opposite side, and with the muscular twigs of the inferior maxillary nerve 6.

The inferior maxillary nerve 6,† the third branch of the fifth pair of nerves, emerges at the foramen ovale of the sphenoid bone, as seen in Part I., Plate V., *Figs.* 9 and 10, digits 4, and divides where it descends between the two pterygoid muscles into two branches; the one superior and smaller, the other inferior and greater. The former or smaller branch, as seen in Plate VII., is observed to give origin to a number of small twigs, which proceed to the various muscles in the vicinity; thus, a masseteric twig supplies the masseter, part of the temporal and external pterygoid muscles, and also the articulation of the lower jaw-bone; an exterior deep temporal

* The proximity of the lingual nerve to the lingual artery at the corner of the os hyoides x, should be considered in securing the artery when wounded, or when extirpating the tongue.

† Also termed gustatory nerve.

twig supplies only the temporal muscle; an internal deep temporal twig is also distributed on the temporal muscle, and sends twigs onwards to the orbit, where they join twigs of the second branch of the fifth pair; a superficial temporal twig, also named auricular, supplies the articulation of the inferior maxillary bone, as it proceeds outwards to the cartilage of the external ear, the glands, muscles, and skin: this smaller branch likewise unites with the facial nerve, and sends twigs to the parotid gland s, to the temporal artery *g* imbedded in this body, and even to the skin of the forehead, the temple, and vertex. Some of the latter twigs join the occipital of the second cervical nerve. A buccinator twig, the largest of this branch, proceeds between the pterygoid muscles, supplying them in its progress onwards to the angle of the mouth, where it unites with the facial and mental nerves; supplies in this course the buccinator muscle h, the facial vein *z*, the facial artery *c*, where the latter gives origin to the coronaries of the lips, the zygomaticus major a, the depressor labii inferioris 70, and the depressor anguli oris b. These buccinator twigs are seen more distinctly in Plate VIII., distributed on the buccinator muscle h. The pterygoid nerve is the smallest, and is distributed on the internal pterygoid muscle n, and the circumflexus palati muscle.

After these small twigs are given off, the greater branch or the trunk of the inferior maxillary nerve 6 proceeds between the pterygoid muscles, and again divides into two branches nearly of equal size: the first, marked 4, named nervus mandibulo labialis,* either surrounds or sends twigs to the internal maxillary artery, and when entering the osseous canal along with the branch v of the artery *f*,

* Also termed inferior maxillary nerve.

gives origin to the mylo-hyoideus twig 31, which, as its name indicates, proceeds to the muscle *m*, sending also twigs onwards to the sublingual gland, the anterior head of the digastric muscle *w*, the chin, and the platysma myoides F. The nerve 4 then enters the canal of the bone, giving origin to twigs to the respective teeth and gums.* (The bone is represented in Plate VII. by dotted lines.) Before emerging at the mental foramen *f*, of Plate IX., the nerve sends a twig onwards to supply the rest of the teeth, which unites with the nerve of the opposite side: and after its exit from the foramen, divides into a number of twigs,† that unite with the facial and the buccinator nerves, and supply the depressor anguli oris b, the depressor labii inferioris 70, the levator labii inferioris, the orbicularis oris f, the glands and skin of the lower lip and chin.

The lingual branch 32 of the nerve, immediately after its separation from the preceding nerve, receives a twig 33, named chorda tympani, which emerges from the fissure of Glaserus, and is a twig of the facial nerve; the lingual branch then descends behind or centrad to the internal pterygoid muscle, close to the pharynx, and before or peripherad to the circumflex and levator muscles

* When the nerve at its entrance into the canal of the bone becomes the seat of operation, the surgeon makes an incision with a scalpel from within the mouth on the inside of the ramus, and continuous with the molares. Either the scalpel or a gum lancet may be used to divide the nerve: when the latter is employed, the edge is to be held towards the bone; and when the former, the edge of the knife should be turned downwards or sacrad. The small artery v only should be cut.

† This nerve may be easily divided from within the mouth by entering the knife between the lip and bone; care must however be taken not to wound the coronary artery of the lip. The artery and vein which accompany the nerve must be divided; but are so small as not to require any consideration. The nerve emerges at the mental foramen, which can be always satisfactorily ascertained, as described in page 61 of Part I.

of the palate, to the submaxillary gland *n*, supplying them in its course; at this point the nerve sometimes sends twigs to unite with the lingual nerve, which are distributed on the gland, the mylo-hyoideus, the stylo-glossus, and genio-hyo-glossus, muscles. The nerve then proceeds immediately above, or coronad to the submaxillary duct, as represented in Plate VII., by a bristle introduced onwards to the apex of the tongue, supplying plentifully with twigs the tube. In this course, the nerve gives origin to twigs that descend to unite with those of the lingual nerve: to twigs which ascend to the sublingual gland 80, to the gums of the posterior molar teeth, and to the skin of the mouth; and sends numerous threads to the stylo-glossus, the genio-hyo-glossus, the back, sides, and apex of the tongue, becoming, as it were, the papillæ which are there placed, the semi-lenticulares and villosæ.

* The facial nerve 44† emerges at the foramen stylo-mastoideum of the temporal bone, (seen in Part I., Plate V., *Fig.* 7, letter *f*,) and descends obliquely downwards to the parotid gland s, dividing in its substance into two

• Also named portio dura, and sympatheticus minor.

† When the facial nerve 44 becomes the seat of operation, the chief object to be avoided is the internal jugular vein M. The head of the patient should be turned to the side opposite to that on which the operation is to be performed. An incision about an inch long in the adult should be made immediately below the lobulus of the external ear, parallel to the anterior or tracheal fibres of the sterno-cleido-mastoideus, where they are attached to the mastoid process; then a narrow spear-pointed straight bistoury should be introduced close by the mastoid process, with the back downwards or sacrad, and the cutting edge upwards or coronad, and the point looking also obliquely upwards or coronad to the base of the cranium: this should be pushed onwards to the bone, and afterwards carried upwards in the direction of the ear, between the styloid and mastoid processes, so as to divide the nerve. If the operator proceed carelessly, he is very apt to wound the vein M, as may be readily understood by examining Plate VIII. (and the osteology, Part I., Plate IV., *Fig.* 2, letters w and *f*.) The small posterior auris *e* is the only artery which should be wounded.

branches; but before entering the gland, the nerve gives origin to a posterior auricular or occipital twig, which generally unites with the occipital twig of the third cervical nerve, and afterwards subdivides into a proper auricular twig, and an occipital twig; the former supplying the concha, the retrahentes auris muscle, and the skin; the latter or occipital supplying the sterno-cleido-mastoideus, the splenius capitis, the occipito-frontalis, and the skin behind the ear. A twig from the facial supplies the stylo-hyoideus muscle w, unites with the great intercostal 7, and advances as far as the genio-hyoideus muscle *l*; while another twig supplies the digastric muscle w, and subdivides into two; the one, ascending near the foramen lacerum posterius, joins the glosso-pharyngeal; the other, descending behind the styloid process *q*, joins the laryngeal branch 55 of the nervus vagus.

Where the trunk of the facial nerve 44 divides into its two branches in the substance of the parotid gland, it lies superficially to the temporal artery and vein, supplying them along with the gland. The superior and larger of these branches ascends in the substance of the gland, and gives origin to a number of branches, that are connected together by small twigs like a net, which arrangement, and a similar one of the lower branch, is compared to a goose's foot, and named pes anserinus. The twigs of the superior branch are, the zygomatic nerve,* the second temporal nerve,† the anterior temporal nerve,‡ the superior orbital nerve,‖ the inferior orbitary nerve,§ the superior facial nerve, the middle or great facial nerve, and the inferior facial nerve; which different twigs, represented truncated in Plate IX., are seen in Plate X.

* Also named jugalis primus, or posterior temporal.

† Termed also jugalis secundus.

‡ Named also jugalis tertius.

‖ Also styled jugalis quartus.

§ Also denominated jugalis quintus.

emerging from the parotid gland s, like white threads, and extensively ramified all over the cranium and face. They unite with the auricular, the occipital, the facial of the other side, the subcutaneous twigs of the second branch of the fifth pair, the frontal twig of the first or ophthalmic branch of the fifth pair, which is seen accompanying the frontal artery 91, with the twigs of the second branch of the fifth pair in the orbit, with the infra-orbitary nerve 2, and with the buccinator twig of the third branch of the fifth pair. They supply the muscles of the cartilage of the ear, the temporal muscle u, the occipito-frontalis q, the orbicularis palpebrarum w, the corrugator supercilii, the zygomaticus major a muscles, the parotid duct x, the facial vein z, the facial artery *c*, the levator labii superioris alæque nasi i, the levator anguli oris o, the depressor labii superioris, the compressor naris n, the buccinator h, and the depressor anguli oris b muscles; and are also minutely distributed over the skin and cellular substance.

The inferior branch of the facial nerve descends in the parotid gland, and divides also into several twigs, as the lowest anterior facial nerve, the nerve of the margin of the inferior maxilla, and the subcutaneous nerves of the neck; the first of these extending to the mouth, like some of the twigs of the superior branch, and there forming junctions, of a net-work appearance, with the inferior facial twig, and with the buccinator twigs of the third branch of the fifth pair, and supplying the skin of the mouth, the depressor anguli oris b, and the platysma myoides F muscles. The second branch descends to the angle of the inferior maxillary bone, unites with the other principal twigs of the nerve and those of the third cervical nerve in this region, and then divides into two twigs; the superior ascending on the masseter muscle l, and running to the mouth, supplying the orbicularis f, and the depressor labii

inferioris, 70, muscles; and in this course, like the other nervous twigs of the face, forming numerous net-work junctions; first, with the preceding twig; secondly, with the buccinator twigs; thirdly, with the different twigs ramified on the lips of the second and third branches of the fifth pair; and fourthly, with the gustatory branch 32, of the inferior maxillary nerve 6. The inferior twig runs beneath the depressor anguli oris, supplying this muscle with nervous threads, and is distributed on the skin of the chin, and orbicularis oris muscle f, forming junctions with the mental nerve 4. The subcutaneous twigs of the neck descend below or sacrad to the inferior maxillary bone, unite with the twigs of the mental nerve, with those of the opposite side, with those of the third cervical nerve, and are distributed on the depressor anguli oris, the platysma myoides, and on the skin from the chin downwards below the larynx.

The infra-orbitary nerve 2, the chief twig, or the continuation of the second or superior maxillary branch of the fifth pair of nerves, enters the infra-orbitary canal at the bottom of the orbit (seen in Part I., Plate VI. *Fig.* 15, letters *o*,) along which it runs, giving origin to twigs that supply the teeth, and emerging at the infra-orbitary foramen *o*, along with the artery of the same name. At its emergence the nerve divides into a number of twigs, which spread in all directions,* uniting with each other, with

* The radiated branches of this nerve must be kept in view by the operator. From the distance between the lining membrane of the mouth and this nerve, it cannot be divided from within, but can be easily divided from without, by first drawing a perpendicular line from between the two bicusped teeth to the margin of the orbit, which will bisect the foramen, and then calculating the distance from the orbit, which is about a sixth. A spear-pointed double-edged scalpel should be employed to transfix the integuments and levator labii superioris i, down to the

the buccinator twigs, and with the facial twigs, forming the infra-orbitary plexus; and the twigs which derive their origin from this plexus supply the orbicularis palpebrarum muscle w, the inferior eye-lid, the caruncula lachrymalis, the ductus lachrymalis, the skin of the cheek, the nose, the compressor naris n, the levator labii superioris i, the depressor labii superioris, the orbicularis oris f, the levator anguli oris o muscles, and the skin of the upper lip and nose.

The frontal nerve,* seen in Plate X. accompanying the frontal artery 91, is a twig of the first or ophthalmic branch of the fifth pair of nerves, and is the continuation of the frontal nerve, and therefore commonly named the proper frontal, to distinguish it from the other twigs given off within the orbit. It emerges along with the artery at the supra-orbitary foramen (seen in Part I., Plate V., *Fig.* 1, letter *n*,) ascends on the forehead, sending twigs to the orbicularis palpebrarum muscle w, the skin of the eye-brow, the occipito-frontalis muscle q, the skin of the forehead, vertex, and temple, and unites with the twigs of the facial nerve.

bone, along which it must grate, making a semicircular sweep, in order to sever all the twigs of the nerve. The knife should evidently be entered a little above the foramen, to secure the division of the superior ascending twigs. The directions here given are only applicable to the adult, for in the young subject the teeth are so much smaller, that the measurement must commence at the anterior edge of the first bicuspis. (See Part I., Plate VI., *Fig.* 15.)

* When the frontal nerve becomes the seat of operation, it may be ascertained by drawing a line, which will bisect the foramen infra-orbitarium and the foramen mentale at the same time.

BLOOD-VESSELS AND NERVES

OF THE

UPPER EXTREMITY.

THE subclavian artery H, on the right side, is a branch of the arteria innominata Q, but on the left side derives its origin directly from the arch of the aorta E, as seen in Plate I., runs between the scalenus anticus muscle L, and the scalenus posticus muscle 50, over the first rib 64, having the axillary plexus 9 immediately above or atlantad, and the subclavian vein *u* below or sacrad, the latter being separated by the scalenus anticus L, as seen in Plates VII. and VIII.

In Plate I. the right subclavian artery, before entering between the scaleni muscles, is observed encircled by the great intercostal nerve 7, the nervus vagus 1, with its recurrent 10, and the vertebral vein N running superficially to it; and gives origin to the vertebral artery R, seen only on the left side, to the ascending thyroideal S, the internal mammary 14, and the superior intercostal artery 12, which last is seen in Plate IV. On the left side, the subclavian artery gives origin to the same branches as on the right, and is encircled with similar nerves, but has the thoracic duct lying superficially to it.*

* On either side, the subclavian artery in this space should never have a ligature thrown round it for aneurism of the axillary artery; on the right side, the arteria innominata can be secured either for this disease, or for a wound of the subclavian on the tracheal side of the scaleni muscles; and on the left side, if the artery be wounded, there can be no alternative but securing it, even at the risk of involving the thoracic duct; but for aneurism this appears scarcely warrantable:

The superior intercostal branch 12,* descends into the thoracic cavity, as seen in Plate IV., crossing the first rib, and dividing into small branches, which extend as far down as the lower margin of the second rib, and accompany the nerves like the other intercostal arteries described in page 14. The vein which returns the blood of this artery is seen in Plate IV., marked 15.

The internal mammary branch 14† of Plate I. runs behind the subclavian vein *u* or *v*, enters the thoracic cavity exteriorly or peripherad to the pleura, and extends to the cartilage of the first rib, which it crosses near its sternal extremity; descending parallel to the sternum *e*, as seen in *Fig.* 2, Plate III., crossing the cartilages of the other true ribs, near their sternal extremities, and running between them and the sterno-costalis muscle, letters B, downwards to the diaphragm, which it pierces in crossing the seventh rib. The artery then enters the abdomen, running between the muscles and the peritoneum nearly as far as the umbilicus, where it divides into small branches, which inosculate with those of the epigastric x, Plate I.; the artery is accompanied by its vein, that joins the subclavian vein. The inosculation of these arteries is distinctly seen in Part IV., Plate II.‡ In Plate I., on the left side, the muscle is cut up to show the artery and vein. The internal mammary in this extensive course gives origin to numerous small branches; some to the sterno-hyoideus muscle, the sterno-thyroideus muscle, the contiguous lymphatic glands, the clavicle, the sternum, the sterno-costalis

yet if the patient be threatened with immediate death, what would he not suffer, and what operation would not the surgeon be justified in attempting, to save his life?

* Also named intercostalis prima.

† Also termed sternal artery.

‡ In the event of this artery being wounded, it should at once be secured.

muscle, the mediastinum, the thymus gland in the fetus, the ribs, and the intercostal muscles; and some of these branches pierce the intercostal and the pectoral muscles, supplying the mammary gland in the female, as seen in Part III., Plate XI., *Fig.* 1, digits 14. A branch is generally given off to accompany the phrenic nerve 8, Plate I., that also contributes to supply the pericardium c, and anastomoses with the thoracics of the axillary artery, and with the intercostal arteries; and near the cartilage of the sixth rib, a branch is seen proceeding to the diaphragm, named the musculo-phrenic, and giving origin to small branches which anastomose with the intercostals.

The vertebral artery R, takes its origin from the opposite or atlantal aspect of the subclavian, and ascending in the neck, enters the foramen in the transverse process of either the seventh or sixth cervical vertebra; and in rare instances, one of the more atlantal vertebræ, even the third; the further distribution of this artery will be described in the Part on the brain; the foramina are seen in Part I., Plate II., *Figs.* 3, 5, and 6, letters *f*. The vertebral vein N, that returns a considerable portion of the blood circulated by the artery, descends through the same foramina, and joins the subclavian vein *v*.

The inferior thyroideal artery s,* is observed in Plate I. to ascend behind the vertebral vein N, on the scalenus anticus muscle L, and in Plate VII. to be encircled by the great intercostal nerve 7, then to run behind the nervus vagus 1, and the common carotid artery P, to the thyroid gland Z, and the larynx, on which the vessel is ultimately distributed; here this branch inosculates with the superior thyroideal *a* of the external carotid, and with its fellow of the opposite side, and in this course

* Also named sacro-thyroidea.

gives origin to twigs that supply the trachea, the œsophagus, and pharynx, and sometimes gives origin to the supra-scapular 51, the superficial cervical 52, and the deep cervical *r* arteries: the latter in the drawing is a branch of the thyroideal, and ascends on the scaleni, to the levator scapulæ 40, and other muscles in the contiguity. In the subject from which the drawings were taken, the superficial cervical 52, and the supra-scapular 51, were given off, after the artery had emerged beyond the scaleni muscles L and 50; the former artery, 52, dips beneath the axillary plexus 9, then emerges and extends across the levator scapulæ muscle 40, which it supplies along with several muscles in the vicinity; the supra-scapular 51 is observed to run beneath the clavicle, and is traced in Part III.* The veins named cervical, which return the blood circulated by these branches, are observed in Plate IX. to run across the subclavian artery H, and to terminate in the angle between the internal jugular M and subclavian *u* veins, as represented in Plate VIII. The subclavian artery, emerging beyond the clavicle A, assumes the name of axillary, the course and branches of which are described in Part III.; the branches which form the subclavian vein *u* are also detailed in Part III. The vein *u* is observed to run on the sternal aspect of the insertion of the scalenus anticus muscle L, to descend into the thoracic cavity behind the sternum, where this subclavian vein is immediately joined by the vein of the opposite side *v*, in order to form the vena cava descendens *h*, as seen in Plate I.; in this course the subclavian vein receives the several cervical branches, the posterior external jugular vein D, as seen in Plate IX., the anterior

* This branch, when it takes its origin from the inferior thyroideal artery s, runs along the under surface of the clavicle, and is then in the way of the knife in performing the operation of securing the subclavian artery above the clavicle.

external jugular vein D, and internal jugular vein M, as represented in Plate VIII., and various thyroideal veins O, as delineated in Plate VII.*

Fig. 4, in Plate III., which exhibits the structure of an artery, is described in Part III.

* When the subclavian artery, between its emergence from the scaleni muscles and the clavicle, becomes the seat of operation, the following directions render it one of the simplest operations of surgery. The patient should be placed on a low table, sofa, or bed, with his body reclining so as to form an obtuse angle with the thighs, and his head turned to the side opposite to that on which the operation is to be performed, and bent gently backwards. The arm of the affected side is to be held close to his side, and the shoulder brought sternad and sacrad. The space between the two extremities of the clavicle should be divided into seven proportional parts, when the artery will be indicated three from the sternal and four from the scapulary end of the clavicle, running over the first rib. An incision parallel to, but quite clear of, the clavicle, is to be made, proportional in length to the age of the patient, and to the thickness of skin and cellular substance, through these parts and the platysma myoides, when the operator will feel the scapulary margin of the sterno-cleido-mastoideus muscle, which is to guide him to the artery. The knife ought then to be laid aside, and the loose watery cellular tissue torn with the fingers or the handle of the scalpel, when the surgeon will soon feel the pulsation of the artery. The scapulary margin of the scalenus anticus muscle should be felt as well as the tubercle of the first rib into which this muscle is inserted, before the needle is attempted to be used. The aneurismal needle, or Weiss's instrument, should be passed round the artery from the tubercle of the first rib to the scalenus posticus, carefully surrounding the artery, to avoid including any of the nerves forming the axillary plexus. The ligature can be easily tied with the fingers, by twisting its ends round the middle fingers, and inserting the forefingers into the wound down to the artery, which is preferable to all the serre-nœuds ever invented. I witnessed Mr. Wishart perform this operation in the Royal Infirmary, nearly according to these rules, with great dexterity; no veins were wounded, no nerve included, and no serre-nœud employed; and the patient has done well. The measurement and chief directions here given, are from the MS. Lectures of that able anatomist Mr. Walker, formerly Lecturer on Anatomy and Physiology, Edinburgh. I need scarcely observe, that I have put this measurement, and the others invented by him, repeatedly to the test of experiment, and found them invariably correct. The chief danger in this operation is the wounding the subclavian vein *u*, seen in Plates VII. and VIII., which may be greatly avoided by compressing the veins of the arm with a tourniquet; for nature, with her infinite wisdom, has placed one or more valves at the junction of the internal jugular and subclavian veins, so that

the blood flowing down the former cannot retrograde along the latter to the arm, but must run onwards to the heart. In Plate III., figure 3, is a representation of the union of these veins of the left side; M indicates the internal jugular vein descending to terminate in the subclavian vein *v*, V; italic *v* the proximal extremity of the vein which proceeds to join the other subclavian vein, in order to form the vena cava superior; and the roman capital V the brachial or distal extremity. The valves, three in number, are observed in this latter extremity of the vein, and are marked *a*; these are sometimes two in number, and sometimes only one; but still the one is capable of doing the duty of the three. I may here remark, that three valves are the number generally found in the veins of both the upper and lower extremities. In the preceding operation, I have directed the loose cellular tissue to be torn with the fingers, in place of being cut with the scalpel, which obviates the risk of wounding both arteries and veins; when the latter, which are sometimes numerous, as observed in Plate IX., are injured with the fingers, they are more bruised than cut, and consequently do not bleed so freely, and embarrass the operator, who also by this manner of proceeding will more certainly avoid wounding either the subclavian or internal jugular veins, as well as the supra-scapular artery 51, Plate IX., which, when a branch of the inferior thyroideal, generally runs in the way of the knife. There is a peculiarity in Plate IX. with respect to the omo-hyoideus muscle U, but which I have observed to be very common, and have therefore represented it: the muscle adheres to the clavicle A, so as to take its course below or sacrad to the subclavian artery H, whereas it is commonly represented running superior or atlantad to the artery, which has arisen, I presume, from the muscle having been too much detached in the dissection before drawn. The artery H appears higher up or more atlantad than is imagined, which is generally the case on the right side, in consequence of the subclavian being a branch of the arteria innominata, and also of the position of the subject here chosen, in order to bring the greater number of objects into view. In the event of the omo-hyoideus U interfering in the operation, it may be easily pushed to one side, and to the superior or atlantal will generally be found the easier.

ERRATUM.

In page 31, the 11th line from the bottom; for 'lumbar nerve 6,' read 'lumbar nerves 6.'

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART II.

THE BLOOD-VESSELS AND NERVES OF THE HEAD AND TRUNK.

PLATE I.

A, Ribs
B, Diaphragm
C, Pericardium
D, Right ventricle of the heart
E, Aorta
F, Pulmonary artery arising from right ventricle D of heart
F, Spleen
G, Lungs
H, Subclavian arteries
I, Œsophagus
K, Trachea
L, Scalenus anticus muscle
M, Internal jugular veins
N, Vertebral veins
O, Trunk of thyroideal veins
P, Carotid arteries
Q, Arteria innominata
R, Vertebral artery
S, Inferior thyroideal artery
T, External iliac artery
U, External iliac vein

a, Muscular parietes of abdomen
b, Stomach
c, Duodenum
d, Right auricle of heart
e, Gall bladder
f, Suspensory ligament of liver
g, Round ligament of liver
h, Great omentum
i, Liver
k, Uterus
m, Urinary bladder
p, Gastric artery
q, Hepatic artery
r, Splenic artery
s, Arteria gastro-epiploica dextra
w, Arteria gastro-epiploica sinistra
x, Epigastric artery

PLATE I. *(Continued.)*

a, Peritoneum
d, Left auricle of heart
h, Vena cava superior
k, Broad ligament of uterus
l, Round ligament of uterus
r, Right coronary artery
s, Left coronary artery
t, Vena azygos
u, Right subclavian vein
v, Left subclavian vein
x, Epigastric vein

1, Nervus vagus
2, Left pulmonary veins
3, Twigs of cœliac plexus
6, Nervous threads of great intercostal nerve
7, Great intercostal nerve
8, Phrenic nerve
10, Recurrent twigs of par vagum
11, Cardiac nerve
14, Internal mammary arteries

PLATE II. *Fig.* 1.

D, Right ventricle
E, Aorta
F, Pulmonary artery

d, Right auricle
f, Right and left branches of pulmonary artery
g, Left ventricle

d, Auricular portion of left auricle
h, Vena cava descendens
i, Vena cava ascendens
k, Coronary vein and branches
r, Right coronary artery
s, Left coronary artery

1, Right pulmonic veins
2, Left pulmonic veins

Fig. 2.

D, Right ventricle
E, Aorta
O, Tricuspid valve

d, Auricular portion of right auricle
l, Fossa ovalis
m, Tuberculum Loweri

n, Eustachian valve
s, Left coronary artery

h, Vena cava descendens
i, Vena cava ascendens
k, Entrance of coronary vein and valve

PLATE II. *Fig.* 3.

D, Right ventricle
E, Aorta
F, Pulmonary artery

d, Right auricle
f, Branches of pulmonary artery

l, Foramen ovale
n, Eustachian valve

f, Ductus arteriosus
h, Vena cava descendens
i, Vena cava ascendens

Fig. 4.

E, Aorta
F, Pulmonary artery
O, Tricuspid valve

p, Columnæ carneæ
q, Semilunar valves of pulmonary artery

d, Left auricle
g, Left ventricle
s, Left coronary artery

Fig. 5.

E, Aorta
F, Pulmonary artery

d, Left auricle
g, Septum ventriculorum

p, Columnæ carneæ of mitral valve
q, Semilunar valves of aorta
o, Mitral valve

Fig. 6.

A, Ribs
D, Heart
E, Aorta
F, Pulmonary artery
G, Lungs
P, Common iliac arteries
T, External iliac arteries
Y, Kidney

d, Venæ hepaticæ
e, Aorta descendens

f, Branches of pulmonary artery
g, Umbilical vein
i, Liver
m, Urinary bladder

f, Ductus arteriosus
f, Ureter leading from kidney
h, Vena cava descendens
i, Vena cava ascendens
n, Umbilical arteries

PLATE III. *Fig.* 1.

A, Musculo-ligamentous membrane of trachea
G, Lungs
K, Trachea

a, Muscular fibres of trachea
b, Bronchial glands
c, Vascular mucous membrane of trachea

f, Branches of pulmonary artery
k, Bronchi

k, Subdivision of bronchial tubes

1, Branches of pulmonary veins
2, Branches of pulmonary veins

Fig. 2.

B, Sterno-costalis muscle

e, Sternum

14, Internal mammary arteries

Fig. 3.

M, Internal jugular vein
V, Distal extremity of subclavian vein

a, Valves of veins
v, Proximal extremity of subclavian vein

Fig. 4.

a, Brachial artery
a, External or cellular coat of artery

a, Middle or muscular coat of artery

l, Internal or serous coat of artery

PLATE IV.

A, Ribs
B, Diaphragm
D, Pancreas
E, Thoracic aorta
F, Spleen
G, Lungs
H, Subclavian arteries
I, Œsophagus
K, Jejunum
L, Ileum
M, Caput cæcum coli
N, Vena portæ
O, Ascending portion of colon
P, Transverse arch of colon, continuation of ascending portion O
P, Carotid arteries arising from arch of aorta E
Q, Arteria innominata arising from arch of aorta E
Q, Mesentery
R, Superior mesenteric artery distributed on intestines
R, Left vertebral artery arising from subclavian artery H
S, Ascending thyroideal artery
T, Dorsal vertebræ
U, Superior mesenteric vein

c, Duodenum
d, Hepatic veins
e, Gall bladder
h, Omentum majus
i, Liver
k, Lobulus Spigelii of liver
k, Left bronchial tube under arch of aorta E
p, Gastric artery
q, Hepatic artery
r, Splenic artery
w, Arteria gastro-epiploica sinistra
z, Diaphragmatic artery

R, Mesentery

a, Œsophageal plexus of nerves
b, Œsophageal arteries
e, Ductus cysticus
f, Ductus hepaticus
g, Ductus communis coledochus
i, Vena cava ascendens
n, Branches of vena portæ
s, Splenic vein
t, Ileo-colic artery
u, Arteria colica dextra
v, Arteria colica media
y, Gastric vein

1, Nervus vagus
2, Pulmonic plexus of nerves
3, Bronchial arteries
4, Bronchial vein
5, Vena azygos
7, Great intercostal nerve
9, Individual intercostal nerves
10, Recurrent of nervus vagus
11, Cardiac twigs of sympathetic nerve
12, Intercostal arteries
14, Nervous twigs from great intercostal nerve contributing to form pulmonic plexus
15, Intercostal veins
16, Nervous thread from great intercostal nerve, joining œsophageal plexus
17, Twigs of great intercostal nerve, forming splanchnic nerve
29, Appendix vermiformis

PLATE V.

A, Ribs
B, Diaphragm
C, Renal artery
C, Quadratus lumborum muscle
E, Thoracic aorta
F, Ureter
G, Supra-renal gland
H, Inferior mesenteric vein
I, Œsophagus close to aorta E
I, Rectum, continuation of colon *z*
K, Psoas magnus muscle
L, Renal veins
M, Psoas parvus muscle
N, Ovaria
O, Common iliac veins
P, Common iliac arteries
R, Superior mesenteric artery
T, External iliac artery
U, External iliac vein
V, Internal iliac artery
W, Iliacus internus muscle
Y, Kidney

b, Inferior mesenteric artery
d, Hepatic vein
e, Abdominal aorta
f, Ureter
k, Uterus
m, Urinary bladder
p, Gastric artery
q, Hepatic artery
r, Splenic artery
x, Epigastric artery
y, Ilio-lumbar artery
z, Diaphragmatic artery

a, Arteria colica sinistra, branch of inferior mesenteric artery b
a, Semilunar ganglia of splanchnic nerves 17
b, Internal hemorrhoidal artery
c, Circumflex iliac artery
g, Spermatic arteries
i, Vena cava ascendens
k, Fallopian tubes
l, Round ligaments of uterus
s, Splenic vein
z, Sigmoid flexure of colon

1, Nervus vagus of right side
7, Trunk of intercostal nerve
8, Ganglia of solar plexus
9, Ganglion of left great intercostal nerve
17, Splanchnic nerve

PLATE VI.

A, Symphysis pubis
B, Sacrum
C, Renal artery
D, Vagina
E, Thoracic aorta
F, Bodies of lumbar vertebræ
I, Rectum
K, Part of psoas magnus muscle
O, Common iliac vein
P, Common iliac arteries
R, Superior mesenteric artery
T, External iliac artery
U, External iliac vein
V, Internal iliac artery
W, Part of iliacus internus muscle

b, Body of sacrum
b, Inferior mesenteric artery, branch of abdominal aorta e
e, Abdominal aorta

PLATE VI. *(Continued.)*

k, Fundus of uterus
m, Urinary bladder
n, Cœliac artery
p, Gastric artery
q, Hepatic artery
r, Splenic artery
z, Diaphragmatic artery

a, Sacro-lateral arteries
c, Gluteal arteries
d, Obturator arteries
e, Uterine arteries
f, Ischiadic arteries
g, Spermatic arteries, deriving their origin from abdominal aorta e
g, Middle hemorrhoidal artery, branch of internal iliac artery v
h, Internal pudic arteries
i, Vena cava ascendens
n, Umbilical artery
p, Sacro-median artery
r, External hemorrhoidal artery
t, Lumbar arteries

3, Last dorsal nerve
6, Lumbar nerves
7, Trunk of great intercostal nerve
9, Ganglion on left common iliac artery
20, Great sacro-ischiadic nerve
21, Obturator nerve
22, Anterior crural nerve

PLATE VII.

A, Clavicle
G, External carotid artery
H, Right subclavian artery
K, Trachea
L, Scalenus anticus muscle
M, Internal jugular vein truncated
N, Cricoid cartilage
O, Inferior thyroideal veins
P, Common carotid artery
Q, Arteria innominata
S, Thyroid cartilage above cricoid cartilage N
S, Inferior thyroideal artery near scalenus anticus muscle L
X, Os hyoides
Y, Inferior constrictor muscle of pharynx

a, Crico-thyroideus muscle
p, Splenius capitis
v, Inferior maxillary branch of internal maxillary artery

Z, Thyroid gland

a, Superior thyroid artery
b, Lingual artery
c, Facial artery
f, Internal maxillary artery
g, Temporal artery
h, Ascending pharyngeal artery
i, Hyo-glossus muscle
k, Genio-hyo-glossus muscle
l, Genio-hyoideus muscle
q, Styloid process
r, Deep cervical artery

PLATE VII. *(Continued.)*

1. Nervus vagus
3. Lingual nerve
4. Nervus mandibulo-labialis
4. Cardiac twig of nervus vagus
5. Middle meningeal artery
6. Inferior maxillary nerve
7. Great intercostal nerve
8. Phrenic nerve
9. Axillary plexus of nerves
10. Recurrent of nervus vagus
11, Cardiac nerve of intercostal 7
12, Accessory nerve of nervus vagus
13. Glosso-pharyngeal nerve
19. Internal carotid artery
21. First cervical nerve
22. Second cervical nerve
23. Third cervical nerve
24. Fourth cervical nerve
31. Nervous twig to mylo-hyoideus muscle
32. Lingual branch of inferior maxillary nerve
33. Chorda tympani nerve
40. Levator scapulæ muscle
50. Scalenus posticus muscle
51. Supra-scapular artery
52. Superficial cervical artery
55. Superior laryngeal nerve
60. Linguales muscle
64. First rib
80. Sublingual gland

PLATE VIII.

A. Clavicle
B. Sterno-thyroideus muscle
D. External jugular vein
E, Sterno-cleido-mastoideus muscle
G. External carotid artery
H. Subclavian artery
I. Œsophagus
L. Scalenus anticus muscle
M. Internal jugular vein
P, Common carotid artery
S. Thyroid cartilage
T. Superior laryngeal veins
X. Os hyoides
Y. Constrictor pharyngis inferior muscle
Z. Thyro-hyoideus muscle
h. Buccinator muscle
k. Stylo-pharyngæus muscle
m. Stylo-glossus muscle
n. Internal pterygoid muscle
p. Splenius capitis muscle
t. External pterygoid muscle

a. Superior thyroid artery
b. Lingual artery
c. Facial artery
d. Occipital artery
e. Auricular artery
f. Internal maxillary artery
g. Temporal artery
h. Ascending pharyngeal artery
i. Hyo-glossus muscle
m. Mylo-hyoideus muscle
p. Pharynx
u, Subclavian vein

PLATE VIII. *(Continued.)*

3, Lingual nerve
5, Descendens noni nerve
8, Phrenic nerve
9, Axillary plexus of nerves
12, Accessory nerve of nervus vagus
13, Glosso-pharyngeal nerve
19, Internal carotid artery
22, Second cervical nerve
23, Third cervical nerve
24, Fourth cervical nerve
25, Inferior maxillary bone
40, Levator scapulæ muscle
44, Facial nerve
51, Supra-scapular artery
52, Superficial cervical artery
55, Superior laryngeal nerve
64, First rib
80, Trapezius muscle

PLATE IX.

A, Clavicle
C, Sterno-hyoideus muscle
D, External jugular vein
E, Sterno-cleido-mastoideus muscle
G, External carotid artery
H, Subclavian artery
M, Internal jugular vein
P, Common carotid artery
T, Laryngeal veins
U, Omo-hyoideus muscle
V, Lymphatic glands
W, Posterior head of digastric and stylo-hyoideus muscles
X, Os hyoides
Z, Facial vein

a, Zygomaticus major muscle
h, Buccinator muscle
l, Masseter muscle
o, Levator anguli oris muscle
u, Temporal muscle
y, Temporal vein

a, Superior thyroid artery
c, Facial artery
d, Occipital artery
e, Auricular artery
f, Mental foramen
g, Temporal artery
m, Mylo-hyoideus muscle
n, Submaxillary gland
o, Infra-orbitary foramen
w, Anterior head of digastric muscle

2, Infra-orbitary nerve
3, Lingual nerve
4, Mental nerve
5, Descendens noni nerve
9, Axillary plexus of nerves
12, Accessory nerve of nervus vagus
20, Zygomatic process of temporal bone
22, Second cervical nerve
23, Twigs of third cervical nerve
40, Levator scapulæ muscle
44, Facial nerve
51, Supra-scapular artery
52, Superficial cervical artery
80, Trapezius muscle

PLATE X.

A, Clavicle
E, Sterno-cleido-mastoideus muscle
F, Platysma myoides muscle

a, Zygomaticus major muscle
b, Depressor anguli oris muscle
c, Zygomaticus minor muscle
f, Orbicularis oris muscle
h, Buccinator muscle
i, Levator labii superioris alæque nasi
l, Masseter muscle
n, Compressor naris muscle
q, Occipito-frontalis muscle
r, Attollens aurem muscle
s, Parotid gland
w, Orbicularis palpebrarum muscle
x, Parotid duct
y, Temporal vein
z, Facial vein

c, Facial artery
d, Occipital artery
g, Temporal artery
z, Frontal branch of facial vein

2, Infra-orbitary nerve
23, Twigs of third cervical nerve
70, Depressor labii inferioris muscle
90, Occipital vein
91, Frontal branch of ophthalmic artery

EDINBURGH:
Printed by John Brewster,
H. Society.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART III.—THE BLOOD-VESSELS AND NERVES.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, LONDON; AND HODGES AND M'ARTHUR, DUBLIN.

1823.

EDINBURGH:
Printed by John Brewster,
11, Society.

TO

SIR ASTLEY COOPER, BARONET,

WHOSE PROFESSIONAL ABILITIES ARE SURPASSED BY NONE;

WHOSE ENTHUSIASTIC ZEAL IN THE PROSECUTION

OF SCIENCE CONTINUES UNABATED;

AND

WHOSE AFFABLE AND CONDESCENDING MANNERS

GAIN HIM UNIVERSAL ESTEEM;

THIS PART IS DEDICATED,

BY

HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART III.

BLOOD-VESSELS AND NERVES

OF THE

UPPER AND LOWER EXTREMITIES.

CONTENTS.

Arteries of the Upper Extremity continued from page xvi *of Contents of* Part II.

	Page
Supra-scapular Artery, (Pt. II. Pl. VII. VIII. IX. dig. 51, and Pt. III. Pl. XII. fig. 1, dig. 51,) - -	87
Axillary Artery, (gives origin to) (Pl. XI. fig. 1, II,)	83
Thoracic Arteries, (Pl. XI. fig. 1, letters a,)	84
Subscapular Artery, (Pl. XI. XII. figs. 1, c, c,)	85
Posterior Circumflex Artery, (Pl. XI. XII. figs. 1, d,) - - - - -	85
Anterior Circumflex Artery, (Pl. XI. fig. 1, e,)	87
Brachial Artery, continuation of Axillary, (gives origin to) (Pl. XI. fig. 1, b,) - -	88
Profunda Superior Artery, (Pl. XI. XII. figs. 1. f,) - - - - -	89
Profunda Inferior Artery, (Pl. XI. fig. 1, k,) -	89
Anastomoticus, (Pl. XI. fig. 1, m,) - -	89
Ulnar Artery, (gives origin to) (Pl. XI. XII. figs. 2, *h*,) - - -	90
Recurrent Artery, (Pl. XII. fig. 2, n,) -	91
Interosseous Artery, (Pl. XII. fig. 2, p,) -	91
Volar Arteries, (Pl. XI. XII. figs. 2,) -	91
Digital Arteries, (Pl. XI. XII. figs. 2,) -	91
Radial Artery, (gives origin to) (Pl. XI. XII. figs. 2, o,) - - - - -	92
Recurrent Artery, (Pl. XII. fig. 2, i,) -	92
Superficialis Volæ Arteria, (Pl. XI. XII. figs. 2, *x*,) - - - -	93
Magna Pollicis Arteria, (Pl. XIII. *d*,) -	93
Volar Arteries, (Pl. XII. fig. 2,) - -	93

Arteries of the Lower Extremity continued from page xvi *of Contents of* Part I.

Internal Iliac Artery, (gives origin to) (Pt. II. Pl. V. VI. let. v., pages 26 and 32.)
- Ilio-lumbar Artery, (Pt. II. Pl. V. *y*, page 33.)
- Sacro-lateral Arteries, (Pt. II. Pl. VI. *a*, *a*, page 33.)
- Gluteal Artery, (Pt. II. Pl. VI. *c*, p. 33,) Pt. III. Pl. XVII. *c*, 106
- Ischiadic Artery, (Pt. II. Pl. VI. *f*, p. 33,) Pt. III. Pl. XVII. *f*, 106
- Obturator Artery, (Pt. II. Pl. VI. *d*, page 33.) Pt. III. - 106
- Uterine Artery, (Pt. II. Pl. VI. *e*, page 34.)
- Hemorrhoidal Artery, (Pt. II. Pl. VI. *g*, page 34,) Pt. III. Pl. XIV. *r*, - - - - - - - 106
- Internal Pudic Artery, (Pt. II. Pl. VI. *h*, page 34,) Pt. III. Pl. XIV. *h*, - - - - - - - 106

External Iliac Artery, (gives origin to) (Pt. II. Pl. I. V. VI. r, page 26,) Pt. III. Pl. XV. r, - - - - 106
- Epigastric Artery, (Pt. II. Pl. I. V. x, page 27,) Pt. III. Pl. XV. XVI. x, - - - - - - 106
- Circumflex Iliac Artery, (Pt. II. Pl. V. *c*, page 27,) Pt. III. Pl. XV. XVI. *c*, - - - - - 106

and becomes

Common Femoral Artery, (gives origin to) (Pl. XV. XVI. r,) Inguinal Arteries, (Pl. XV. f,) - - - 106 106

and divides into

Deep Femoral Artery, (gives origin to) (Pl. XVI. c,) - 110
- Internal Circumflex Artery, (Pl. XVI. d,) - - 111
- External Circumflex Artery, (Pl. XVI. e,) - 112
- Perforating Branches, (Pl. XVI.) - - - 111 & 113

Superficial Femoral Artery, (gives origin to) (Pl. XV. XVI. t,) - - - - - - 109 & 113
- Muscular Branches, (Pl. XV. XVI.) - - 113
- Cutaneous Branches, (Pl. XV.) - - - 113
- Anastomoticus, (Pl. XVI. *a*,) - - - 113

and becomes

Popliteal Artery, (gives origin to) (Pl. XVII. r,) - 114
- Muscular Branches, (Pl. XVII.) - - 115
- Articular Arteries, (Pl. XVII.) - - 115
- Rami Gastrocnemii, (Pl. XVII. XIX., *a*, *a*,) - 115

and divides into

Anterior Tibial Artery, (gives origin to) (Pl. XVIII. *t*,) 116
- Muscular Branches, (Pl. XVIII.) - 117
- Recurrent Branch, (Pl. XVIII. *d*,) - 117
- Rami Malleolares, (Pl. XVIII. c, c,) - 117
- Rami Tarsei, (Pl. XVIII. e,) - - 117
- Rami Metatarsei, (Pl. XVIII. e,) - 117
- Digital Arteries, (Pl. XVIII.) - 117
- Digito-fibular of great toe, and Digito-tibial of index toe, (Pl. XVIII. *f*,) - 118

Posterior Tibial Artery, (gives origin to) (Pl. XX. XIX. t,) - - - - 118
- Fibular Artery, (Pl. XX. y,) - 120
- Internal Plantar Artery, (Pl. XX. XIX. *c*,) 116
- *External Plantar Artery, (gives origin to) (Pl. XX. XIX. a,)* - - 119
- *Digital Branches,* (Pl. XX. XIX.) - 119

	Page
Veins of the Lower Extremity, - -	121
Venæ Comites of Anterior Tibial Artery, (and) (Pl. XVIII.) - - - -	122
Venæ Comites of Fibular Artery, (join) (Pl. XX.)	123
Venæ Comites of Posterior Tibial Artery, (and form) (Pl. XIX. XX.) - - -	122
Popliteal Vein, (joined by) (Pl. XX. XVII. u,) -	123
Articular and Muscular Veins, (and) (Pl. XVII.) -	123
Saphena Minor Vein, (Pl. XVIII. XIX. *z*,) - -	121
and becomes	
Superficial Femoral Vein, (joined by) (Pl. XV. XVI. u,)	123
Venæ Comites of Profunda Artery, (Pl. XVI. *c*,) -	123
and becomes	
Common Femoral Vein, (joined by) (Pl. XV. XVI. u,)	123
Saphena Major Vein, (and) (Pl. XVIII. XIX. XX. XV. *b*,)	121
Inguinal and Inguinal Pudic Veins, (and) (Pl. XV. *f*,)	123
Vein of Integuments of Penis, (and) Pl. XV. *e*,)	123
Cutaneous Abdominal Vein, (Pl. XV. *d*,) - -	123
and becomes	
External Iliac Vein, (joined by) (Pt. II. Pl. I. V. VI. u, p. 27,)	
Internal Iliac Vein, (formed by) (Pt. II. Pl. VI. let. x, p. 27,)	
Internal Pudic Vein, (Pl. XIV. XVII.) -	105
Vena Dorsalis Penis, (Pl. XVI. dig. 60,) -	105
Hemorrhoidal Vein, (Pl. XIV.)	
Ischiadic Vein, (Pt. II. p. 32,) (and Pt. III. Pl. XVII.)	107
Obturator Vein, (Pt. II. p. 32,) and Pt. III. -	107
Gluteal Vein, (Pt. II. p. 32,) (and Pt. III. Pl. XVII.)	107
Sacro-lateral Veins, (Pt. II. p. 32.)	
Ilio-lumbar Veins, (Pt. II. p. 32.)	

Continuation of Veins of Trunk. *See page* xviii *of Contents of* Part II.

Veins of the Upper Extremity, -	93
Median Vein, (joins Cephalic and) (Pl. XI. fig. 2, s,) -	94
Basilic Vein, (joined by) (Pl. XI. fig. 2, q, Pl. XIII. q,) - - -	93
Venæ Comites of Radial Artery, (and) (Pl. XI. fig. 2,)	95
Venæ Comites of Ulnar Artery, (and) (Pl. XI. fig. 2,)	95
Venæ Comites of Interosseal Artery, (and forms) -	95
Brachial Vein, (joined by) (Pl. XI. fig. 1. u,) -	95
Muscular Veins, (Pl. XI. fig. 1,) - -	95
and becomes	
Axillary Vein, (joined by) (Pl. XI. fig. 1, *u*,) - -	95
Venæ Comites of Circumflex Arteries, (and) (Pl. XI. XII. fig. 1,) - - - -	95
Venæ Comites of Subscapular Artery, (and) (Pl. XI. fig. 1,) - - - -	95
Venæ Comites of Thoracic Arteries, (and) (Pl. XI. fig. 1,) - - - - -	95
Cephalic Vein, (Pl. XI. XIII. figs. 2, r,) - -	94
and becomes	
Subclavian Vein; *see page* xvii *of* Contents of Part II.	

	Page
Nerves of the Upper Extremity.	
Axillary Plexus, (divides into) (Pt. II. Pl. VII. VIII. IX. dig. 9, p. 55, and Pt. III. Pl. XI. XII. figs. 1, dig. 1,) - -	96
Thoracic Nerves, (Pt. II. Pl. IX. p. 56, and Pt. III. Pl. XI. fig. 1, dig. 7,) - - -	96
Supra-scapular Nerve, (Pl. XII. fig. 1, dig. 8,) -	96
Subscapular Nerve, (Pl. XI. XII. figs. 1,) - -	96
Cutaneous Nerve of Wrisberg, (Pl. XI. fig. 1,) -	97
Internal Cutaneous Nerve, (Pl. XI. figs. 1, 2, dig. 4,) -	97
External Cutaneous Nerve, (Pl. XI. figs. 1, 2, dig. 3,) -	98
Median Nerve, (divides into) (Pl. XI. XII. figs. 1, 2, dig. 2,)	96
Digital Twigs, (Pl. XI. XII. figs. 2,) - -	96
Ulnar Nerve, (divides into) (Pl. XI. XII. figs. 1, 2, dig. 5,)	99
Anconal Twig, (Pl. XII. fig. 2, dig. 15, and Pl. XIII. dig. 15,) - - - - -	100
Digital Twigs, (Pl. XI. XII. figs. 2,) - -	100
Deep Twig, (Pl. XII. fig. 2,) - - -	100
Spiral Nerve, (divides into) (Pl. XI. XII. figs. 1, 2, dig. 6,) -	101
Cutaneous Twig, (divides into) (Pl. XI. XII. figs. 2, dig. 16,) - - - - -	101
Palmar Twig, (Pl. XI. XIII. figs. 2, dig. 36,) -	101
Anconal Twig, (Pl. XI. XIII. figs. 2, dig. 46,) -	101
Deep Twig, (Pl. XII. fig. 2, dig. 26,) - -	101

	Page
ves of the Lower Extremity, (Pt. II. p. 36,) Pt. III.	124
Spermatic Nerve, Twig of first Lumbar Nerve, XV. dig 1,) - - - -	124
Plexus, (Pt. II. Pl. V. p. 29, Pt. III. Pl. XVI.) -	124
mbar Nerve, (Pl. XV. dig. 3,) - - -	125
l Nerve, (divides into) (Pl. XV. XVI. dig. 22,)	125
Twigs, Muscular Twigs, and Nervus Saphenus, XV. XVI. XVIII.) - - -	125
erve, (Pt. II. Pl. VI. dig. 21, Pt. III. Pl. XVI. dig. 21,)	126
, (forming Sacral Nerves, and giving origin to) XIV. dig. 6,) - - - -	126
Gluteal Nerve, (Pl. XVII.) - -	126
luteal Nerve, (Pl. XVII.) - -	127
Nerve, (gives origin to) (Pt. II. Pl. VI. dig. 20, III. Pl. XVII. dig. 20,) - - -	127
Twigs, - - - - -	127
Cutaneous Twig, (Pl. XVII. dig. 1,) -	128
osterior Twig, (Pl. XVII. dig. 2,) - -	128
nto	
bial Nerve, (gives origin to) (Pl. XVII. XIX. XX. dig. 23,) - - -	128
cular and Cutaneous Twigs, (Pl. XVII. XIX.)	129
ides into	
Plantar Nerve, (Pl. XIX. XX. dig. 25,) -	129
al Plantar Nerve, (divides into) (Pl. XIX. XX. dig. 24,) - - -	128
Digital Twigs, - - - -	129
e, (divides into) (Pl. XVII. dig. 26,) -	130
r Tibial Nerve, (Pl. XVII. XVIII. XX. dig. 28,) - - -	131
us Superficialis, (Pl. XVII. XVIII. XX. dig. 5,)	130
Communicans Tibiæ, (Pl. XVII. XIX. XVIII. dig. 4,) - - -	130

BLOOD-VESSELS AND NERVES

OF THE

UPPER EXTREMITY.

In Part II., page 69, the subclavian artery is traced to its emergence beyond the clavicle, where it assumes the name of axillary; and in Plate XI. we observe the artery H entering the axilla, between the thorax and the scapula, having the serratus magnus muscle O on its proximal and sternal side, and the subscapularis muscle on its distal and dorsal aspect; while the two pectoral muscles, the major C, and minor D, along with the clavicle A, protect it externally or atlantad: this is very distinctly seen in Part VI., Plate VIII. Where the two pectoral muscles extend over the artery, they are cut across, and represented with thin scattered fibres. In this course, from the clavicle A to its emergence beyond the distal margins of the greater pectoral muscle C, and latissimus dorsi muscle E, which, along with the teres major muscle F, that is incorporated with the insertion of the latter, form the folds of the axilla, the artery is surrounded with the axillary plexus of nerves 1, the axillary vein *u*, a number of lymphatic glands *a*,* and a quantity of adipose cellular

* The close proximity of the axillary glands to the axillary vessels should be attended to in their extirpation when cancerous.

substance,* and gives origin to several thoracic branches, a subscapular branch, a posterior circumflex branch, and an anterior circumflex branch. The thoracic branches a, a, are so irregular, that it is surprising any anatomist should have given them individual names ;† they arise some-

* The intimate connexion of the axillary artery with the axillary vein and axillary plexus of nerves, where it runs under the pectoral muscles, presents such a difficulty to the operator, that no surgeon appears justified in attempting to secure the vessel here, when the artery can be tied with facility above the clavicle, as detai -d in Part II., page 69. Even if recently wounded, I should prefer pursuing this plan, and compressing the wounded part of the vessel, as is daily done when the arteries of the hand or foot are injured. When the artery is wounded on its emergence from the axilla, it may be secured by elevating the arm as high as possible, and supinating the hand, the patient being previously laid on a bed or table; an incision is then to be made over the head of the os brachii, a little on its ulnar aspect, and nearly in the centre of the axilla, parallel with the margins of the pectoralis major and latissimus dorsi muscles, through the skin and cellular substance, when the pulsation of the artery will be felt, the median nerve 2, lying superficially, and the axillary vein *u*, internally or ulnad to the vessel. A few scratches with the knife or its handle, or the nail of the finger, will sufficiently separate these objects, so as that the operator may insert the aneurismal needle between the vein and artery, carrying the instrument closely around the vessel from the ulnar to the radial aspect, in order to avoid including one of the satellite veins, or any of the nerves which too frequently embrace very closely the artery, and again unite. The artery runs a little on the ulnar side of the head of the os brachii, and is nearer the pectoralis major than the latissimus dorsi muscle. As one of the venæ comites frequently crosses the artery from the radial aspect of the arm, the operator should lay aside the scalpel, after making the incision through the skin and cellular substance; but if he continue employing the knife, he should lateralize its cutting edge towards the radial aspect, in order to avoid wounding the axillary vein. A peculiarity of the muscles frequently occurs here; for example, a bold fleshy slip often extends from the latissimus dorsi across the artery and accompanying vessels, to th insertion of the pectoralis major, which might deceive and embarrass the operator and which is sometimes as strong as the coraco-brachialis muscle.

† They are named the long or superior thoracic or external mammary; highest thoracic; the alar; the humeral; the acromial; the external superi and the external inferior thoracics. The course of the long or external mamm branch, which descends on the inferior or sacral margin of the pectoralis m muscle, and afterwards ascends to the mammary gland, should be considered b operator when extirpating this gland; and the two external semi-elliptical, a

times by one trunk, sometimes by two, three, four, and even by six branches; and supply the two pectoral muscles, the serratus major anticus muscle o, the intercostal muscles, the subscapular muscle, the deltoid muscle B, and the glands in the axilla and skin; anastomosing with branches of the supra-scapular artery, the superficial cervical artery, the intercostal arteries, and of the internal mammary artery.

The subscapular c,* the largest branch given off by the axillary artery, descends on the margin of the subscapular muscle to the inferior angle of the scapula, supplying in this course the different muscles in the vicinity, the axillary glands, and the capsular ligament of the shoulder-joint, and anastomosing with branches of the superficial cervical artery: this continuation of the artery is named scapularis interna. Shortly after its origin, the subscapular artery sends off a branch *c*, termed the scapular circumflex,† that passes between the scapula and the conjoint tendon of the latissimus dorsi E and teres major F muscles, and which subdivides into branches that supply the teres major, the teres minor 80, the infra-spinatus 81, and the deltoid B muscles; and into one that runs beneath the infra-spinatus muscle on the bone, and ascends to inosculate with the supra-scapular artery, 51, as seen in *Fig.* 1, Plate XII. The posterior circumflex artery d,‡ which is the most important branch to the surgeon, §

as the deeper incisions, should be made from the axilla to the sternum, that this artery may be cut only once.

* Syn. Infra-scapular; inferior scapular; and scapular artery.

† Named also dorsalis scapulæ inferior.

‡ Syn. The anconal circumflex; the articularis posterior; the reflexa humeri; and the humeralis.

§ The posterior circumflex artery is concerned in the amputation of the shoulder-joint; and when this operation is to be performed, the patient should be seated on a chair, and the hand supinated as much as possible, in order to remove the long

twines round the neck of the os brachii, proximal to the conjoint insertions of the latissimus dorsi and teres major muscles, between the bone and the long head G of the tri-

head of the biceps muscle from the axillary plexus of vessels; and then two semi-elliptical incisions are made from the acromion scapulæ to the axilla, the internal extending merely through the skin, but the external as deep and as bold as the operator can accomplish, and both as far distad as to avoid the posterior circumflex artery; the internal or sternal incision through the skin being necessarily made first. The external or dorsal incision having extended through the deltoid muscle to the bone, the operator cuts the insertions of the teres minor, infra-spinatus, and supra-spinatus muscles, and at the same time the capsular ligament; and from the arm being completely supinated, he will reach at this stage of the operation the long tendon of the biceps, by cutting across which the joint is completely dislocated, and the assistant can easily insert his thumb between the bone and the inner flap, so as to compress the axillary artery with its branches: the operator then cuts through the muscles, blood-vessels and nerves, with one or two strokes of the knife, making the flap correspond with the incision through the skin made at the commencement of the operation. The muscles cut in the inner flap are, first, the insertion of the subscapularis; secondly, the remainder of the acromial and clavicular portions of the deltoid, with the pectoralis major, short head of the biceps, and coraco-brachialis; and thirdly and lastly, the latissimus dorsi, teres major, and long head of the triceps. The posterior circumflex artery adhering to the scapular portion of the deltoid muscle, is reflected along with the outer flap, and hence is not wounded till after the assistant has compressed the axillary artery. It would be foreign to the design of this work to enter into an examination of the different modes of amputating the shoulder-joint; but I may observe, that this is the quickest, that less blood is lost, and that there is less risk of sinuses forming in the axilla, which I have seen extend to the crista of the os ilium: the two first positions can be easily verified on the dead body, and to imitate the circulation, an injecting pipe should be inserted into the opposite subclavian artery. When cutting across the insertions of the teres minor, infra and supra-spinati muscles, the edge of the knife should be held at a right angle to the head of the os brachii. If the operator despise well-formed external incisions, he may begin the outer flap from the axilla, carrying it upwards to the acromion scapulæ; and when the assistant has inserted his thumb between the bone and the artery, so as to compress the latter, he may cut outwards, through blood-vessels, nerves, muscles, and skin, making this inner correspond with the outer flap. A strong argument in favour of this latter method is, that in the adhesion of flaps either in amputation or extirpation of the mamma, nature makes so elegant a union, that all irregularities are obscured.

ceps muscle, and proceeds to the deltoid muscle B, as seen in *Fig.* 1, Plate XII. In this course it naturally supplies these, and other contiguous muscles, as well as the capsular ligament and joint of the shoulder, anastomosing with branches of the subscapular, with which it sometimes arises conjointly from the axillary artery. The commencement of this branch is seen in Plate VIII. of Part VI. In rare instances this branch derives its origin from the brachial artery, distad to the insertion of the latissimus dorsi and teres major muscles.

The anterior circumflex* e, a small branch of little importance, arises sometimes from the axillary, and sometimes from the posterior circumflex arteries, runs round the thenal aspect of the neck of the os brachii, beneath the coraco-brachialis K, which is here represented as if it were under the artery, the biceps L, and deltoid B muscles, supplying them and other muscles in the contiguity, and anastomosing with the posterior circumflex and subscapular arteries. The supra-scapular artery† 51, *Fig.* 1, Plate XII., which in Plates VII., VIII., and IX. of Part II, was seen to be a branch of the subclavian artery, is observed to run under the proper posterior ligament *a* of the scapula, and beneath the supra-spinatus muscle 66, the greater portion of which is here removed, also below the acromion scapulæ D, where it surrounds the joint, and inosculates with the subscapular and posterior circumflex arteries. This branch is also seen in Part VI., Plate IX., *Fig.* 2. The supra-scapular is sometimes a branch of the inferior thyroideal, and sometimes a branch of the axillary artery.

* Also named the thenal circumflex, and articularis anterior.

† Syn. The superspinal; the dorsalis scapulæ superior; the transversalis scapulæ; and the transversalis humeri.

The axillary artery H, as soon as it emerges beyond the folds of the axilla, assumes the name of brachial h,* and descends along the ulnar margins of the coraco-brachialis K and the biceps L muscles, a little beyond the elbow-joint, where the pronator radii teres muscle I crosses it, as seen in *Fig.* 2. In this course the artery is covered only by skin, cellular substance, and the fascia of the arm, excepting at its distal or lower portion, where the tendinous expansion l, *Fig.* 2, of the biceps muscle extends across it to the fascia of the fore-arm; and in this extent is generally accompanied by the median nerve 2 lying superficially, and the brachial vein u internally or ulnad.† This artery gives origin to irregular muscular

* Also termed the humeral portion of the brachial artery, or simply the humeral artery.

† When the brachial artery becomes the seat of operation, the arm should be laid on a table with the hand supinated, and an incision made through the skin, cellular substance, and fascia of the arm, along the margin of the coraco-brachialis muscle if in the upper or proximal half of the arm, and along the margin of the biceps muscle if in the lower or distal portion of the arm. The pulsation of the artery will soon be felt, and the vessel must be carefully separated from the median nerve, brachial vein, and other concomitant veins which are generally present, either by the scalpel, its handle, or the nail of the finger. If the scalpel be used, its cutting edge should be lateralized towards the radial aspect of the arm, in order to avoid wounding the brachial vein. The aneurismal needle should be inserted between the artery and nerve and brachial vein, turning it round the artery from the ulnar to the radial aspect. As veins frequently cross the artery to join the brachial vein, the operator should be on his guard to avoid them; and as muscular slips sometimes extend from the pectoralis major muscle, and from the coraco-brachialis muscle to the inner condyle of the os brachii, the operator should be prepared to encounter them. When a ligature is required to be thrown round the brachial artery for aneurism at the bend of the arm, in the event of a high division of the vessel, the operator should ascertain, by the cessation of the pulsation of the tumour, that he has secured the proper branch. *Fig.* 4. of Plate III., Part II., is a portion of the brachial artery, dissected to illustrate the minute structure of an artery. The letters A indicate the extremes, that on the right hand being cut open to exhibit the internal or serous coat I, which is also seen in the middle of this por-

branches, which are named profunda superior, profunda inferior, and anastomoticus magnus: there are, however, many branches arising from it, equal in magnitude to these. The profunda superior* f, takes its origin from the ulnar aspect, descends between the second g, and third g, heads of the triceps muscle, in company with the spiral nerve 6, winds round the bone of the arm, and emerges on the radial aspect, as seen in *Fig.* 1, Plate XII., between the supinator radii longus N, and the brachieus internus M muscles, where it inosculates with the radial recurrent i, and also in this course with some of the branches of the axillary, with others of the brachial, and sometimes with the ulnar recurrent, supplying the various muscles in its progress. The profunda derives its origin sometimes from the posterior circumflex, and sometimes from the subscapular arteries. The profunda inferior, or minor, k, takes its origin sometimes from the radial, and sometimes from the ulnar aspect; when from the latter, the branch descends on the third head g of the triceps to the ulnar condyle, anastomosing with the ulnar recurrent; and when from the radial aspect, it penetrates the brachieus internus muscle, and inosculates with the radial recurrent. The anastomoticus magnus, or simply anastomoticus m, derives its origin commonly from the ulnar aspect of the brachial artery, a little above the internal or ulnar condyle of the os brachii, and descends on the third head g, of the triceps, around this protuberance of the bone, to anastomose with the recurrent n of the ulnar artery, as seen in *Fig.* 2, Plate XII. The nutritious artery of the os brachii is described also as a parti-

tion marked l, while a, a, show the exterior or cellular coat, dissected off from the middle or muscular coat *a*, *a*. The course of the brachial artery should be considered in relation to amputation of the arm.

* Also named arteria spiralis, and profunda humeri.

cular branch; but all of them are so irregular, that the student who has dissected two arms, is surprised, from their variability, at the importance given them by authors, and wonders why the large branches to the biceps muscle have got no name.

The brachial artery h, as seen in *Fig.* 2, Plate XII., divides into two branches, the radial o, and the ulnar *h*,* near where the pronator radii teres muscle I extends across the fore-arm. The latter or ulnar artery *h*, more properly the continuation of the trunk, runs beneath the pronator teres I, the flexor carpi radialis P, the palmaris longus Q, and the flexor digitorum sublimis R muscles, as seen in this and Plate XI., and emerges between the latter and the flexor carpi ulnaris muscle s, about the distal third of the fore-arm, where running between these two muscles, accompanied with its venæ comites and the ulnar nerve 5,† to the

* Considerable irregularity exists in the division of the brachial artery, for sometimes this takes place as high up as the axilla, and frequently about the middle of the arm. As the branch which may be said to come off high up in the arm, whether it be the radial or the ulnar, for one of them generally pursues the course of the trunk, sometimes runs superficially or peripherad of the fascia of the arm, the young practitioner should be careful, when performing phlebotomy at the bend of the arm in candle-light, that he does not mistake one of these branches for a vein. The ulnar is the branch which more frequently runs superficially to the fascia, but is not the branch that is oftener given off high up in the arm.

† The ulnar artery can only be easily secured in the distal third of the fore-arm, for higher up, or proximad, the vessel is so deeply seated, that when wounded there, it would be preferable to apply compression to the wound, and to throw a ligature round the brachial artery. When it becomes the seat of operation in the distal third of the fore-arm, the arm should be placed on a table with the hand supinated, and an incision made through the skin and cellular substance over the course of the vessel, then the flexor carpi ulnaris separated from the flexor digitorum sublimis by cutting through the fascia of the fore-arm, (for in *Fig.* 2 of Plate XI. the fascia is cut open, and the muscles separated a little, to expose the artery, veins, and nerve) when the pulsation of the artery will be felt. The aneurismal needle should be inserted between the nerve and artery, and carried close around the latter, in order to exclude the venæ comites, which is somewhat difficult, in consequence of their smallness and adhesion to the artery.

pisiform bone T, on the radial aspect of which it descends beneath the palmar aponeurosis v,* and superficially to the annular ligament U, forming an elegant arch in the palm of the hand, which extends to the thumb, there inosculating with the thenal branch *x* of the radial artery o. The course of the ulnar artery beneath the palmar aponeurosis is represented in Plate XI. by dotted lines. This palmar arch *h* of the ulnar artery is named the superficial,† to distinguish it from a deeper one of the radial artery. The ulnar palmar arch is observed to give origin to branches denominated volar, which proceed to the space between each two fingers, where they divide into two branches named digital, as digito-radial and digito-ulnar of the respective fingers; these run along the sides of the fingers to the tips, where they anastomose and form beautiful plexuses of vessels. Shortly after the ulnar has separated from the radial artery, it is observed to give origin to the recurrent n, *Fig.* 2, Plate XII., which pierces the flexor muscles of the fore-arm, winds round the inner condyle of the os brachii, and inosculates with the anastomoticus m of the brachial artery, *Fig.* 1, Plate XI. Nearly opposite the commencement of the recurrent, the ulnar artery gives origin to the interosseous artery p, that descends on the flexor digitorum profundus muscle w, which it pierces, and is distributed on the interosseous ligament distad to the carpus, sending branches to its

* When the artery is wounded in the palm of the hand, it should not to be attempted to be secured there, in consequence of the proneness of the fascia palmaris to inflammation, but taken up proximal to the carpus. I have a gentleman at present under my care, who had the ulnar palmar arch wounded, and which was laid bare by the surgeon, and secured; but both fascia and artery ulcerated, and amputation at the middle of the fore-arm was the ultimate result. Such is the present state of surgery!

† Termed also arcus volaris sublimis.

anconal or posterior surface. The ulnar artery also gives origin to a number of muscular and other branches in its course.

The radial artery o takes its origin at the bend of the arm, runs superficially towards the carpus, first between the pronator radii teres I, and the supinator radii longus n muscles; secondly, between the latter muscle and the flexor carpi radialis muscle r, resting chiefly on the flexor longus pollicis muscle x; and is accompanied by two venæ comites, and for a short distance by the cutaneous twig 16 of the spiral nerve.* At the carpus the radial artery passes beneath the extensor ossis metacarpi *a*, the extensor primi internodii *b*, and the extensor secundi internodii *c* muscles of the thumb, as seen in Plate XIII., winding round the back of this finger, and piercing between the abductor indicis and the adductor pollicis muscles, enters the palm of the hand to form the deep palmar arch *o*, *Fig.* 2, Plate XII., which inosculates with the ulnar palmar arch. In this course the radial, like the ulnar artery, gives origin to a recurrent i, which anastomoses with the profunda superior f; to numerous muscular and other branches; and, as it twines round the thumb,

* When the radial artery requires to be secured, it may be done at any part of the fore-arm, by making an incision through the skin and cellular substance, on the ulnar edge of the supinator radii longus muscle, and then cutting cautiously through the fascia of the fore-arm, which connects this muscle with the pronator radii teres and flexor carpi radialis, so closely as to obscure the artery, excepting at their tendons. The artery is afterwards to be separated from its venæ comites and nerve, and the aneurismal needle passed round from the radial to the ulnar aspect, in order to avoid the nerve, which, however, is sometimes so much radiad, as not to require to be taken into consideration. In this operation, the arm should be laid on a table, with the hand supinated. It is generally very difficult to find out the margin of a slender muscle, such as the supinator radii longus, and this forms the chief obstacle to the operator in reaching this and other similarly situated arteries; again, the fascia binding them so closely, becomes another obstacle.

gives origin to a thenal branch* *x* at the carpus, which inosculates with the superficial palmar arch *h* of the ulnar artery, as observed in *Figs.* 2 of Plates XI. and XII. On the back of the hand the artery sends off one or two small branches, as seen in Plate XIII., that extend across the hand, and generally inosculate with the anconal branch of the interosseous artery; and where it runs between the abductor indicis and adductor pollicis muscles, gives origin to a branch named arteria magna pollicis *d*, but, more correctly, the digito-ulnar of the thumb. From the deep palmar arch *o*, *Fig.* 2, Plate XII., branches proceed between the metacarpal bones, and are lost at the roots of the fingers; one, however, is observed to form, from its magnitude, the chief volar branch which supplies the fore and middle fingers. Although this arrangement of the radial, ulnar, and interosseous arteries is one of those most commonly found, yet great irregularity occurs both in their origins and distributions. Besides those variations mentioned by others, I have witnessed a branch, deriving its origin from the ulnar artery immediately as it separates from the radial, descend superficially between the radial and ulnar arteries, pass beneath the fascia palmaris, and join the superficial palmar arch.†

The veins which return the blood circulated by the subclavian artery and its branches, are divided into two sets, a superficial and a deep seated; the former returning the blood of the integuments, the latter the blood of the muscles and deeper objects. The superficial veins are named the cephalic, basilic, and median. The basilic vein q, Plate XIII., and *Fig.* 2, Plate XI., returns the blood of the integuments situated on the ulnar aspect of

* Named also superficialis volæ.

† The course of the radial, ulnar, and interosseous arteries, should be well considered in relation to amputation of the fore-arm.

the back of the hand and fore-arm, inosculating freely with the cephalic vein r; ascends on the palmar or thenal aspect of the arm, beneath the skin and superficially to the fascia of the fore-arm, and contributes chiefly to form the brachial vein u, *Fig.* 1, Plate XI.; and at the bend of the arm generally communicates with the cephalic and venæ comites. In *Fig.* 2, two veins are observed marked q, and even a third might be lettered, which is seen to be formed on the ulnar aspect; for much greater variety occurs in the veins than in the arteries of the arm. The cephalic vein r collects the blood on the radial aspect of the back of the hand and the fore-arm, as seen in Plate XIII., and *Fig.* 2 of Plate XI., inosculating freely with the basilic vein q; ascends on the thenal or palmar aspect of the fore-arm like the basilic, and at the bend of the arm generally communicates with the basilic vein, and venæ comites; afterwards ascends on the radial aspect of the arm, running between the pectoralis major c, and the deltoid B muscles; ultimately joining the axillary vein *a* near the point where it becomes the subclavian vein. The median vein s,* *Fig.* 2, Plate XI., collects the blood from the integuments, between the cephalic and basilic veins on the palmar or thenal aspect of the fore-arm, along which it runs to the bend of the arm, and divides into two branches, the one joining the basilic, and the other the cephalic, and named median cephalic v, and median basilic t veins. In place of this arrangement, there is sometimes merely a communicating branch between the cephalic and basilic veins; indeed, as I have already mentioned, scarcely two arms correspond in the distribution of these veins.†

* Named also mediana longa, and mediana longa major.

† One of these veins, generally the median basilic t, is commonly selected for phlebotomy; but here it is observed to be more than any of the other veins sur-

The radial and the ulnar arteries are observed in Plate XI., *Fig.* 2, each to be accompanied by two veins, termed venæ comites, or satellites, which ultimately join the brachial vein u; and in this course they are observed to communicate with the superficial veins at the bend of the arm.* The brachial vein u, formed by these venæ comites of the radial, interosseal, and ulnar arteries, with the basilic and its median branch, ascends on the ulnar side of the brachial artery h, to the axilla, where it assumes the name of axillary, receiving branches as it pursues this course; the axillary vein *u* then accompanies the axillary artery under the clavicle, and changes its name to subclavian, which is described in page 70 of Part II. One of the radial satellite veins is seen to continue ascending on the radial side of the brachial artery, which it crosses near the axilla to join the axillary vein *u*; and in this course forms a communication with the brachial vein u, by a short transverse branch, a circumstance by no means of unfrequent occurrence.† Besides these veins, there is observed one or two veins accompanying each of the different small branches of the artery of the arm; and where they join the brachial or axillary vein, two or more valves occur, similar to those represented in Plate III., *Fig.* 3, of Part II., or resembling the semilunar valves at

rounded with nervous threads, while the median cephalic is the least: the former, however, from being the larger, is usually preferred, and hence nervous tumours sometimes result. It is the median basilic vein which is sometimes transfixed, and the artery wounded, so as to form the varicose aneurism.

* The junction of the venæ comites of the arteries with the superficial veins, accounts for the difficulty that frequently occurs in stemming the bleeding after phlebotomy; and why pressure below or distad to the wound does not arrest the stream of blood.

† The communication of these veins forms a point of consideration for the surgeon when cutting down in order to secure the artery when wounded, or for aneurism.

the mouth of the aorta, or the pulmonary artery: several other valves are also seen along the course of the brachial vein u, and more of these occur in the upper than in the lower extremities or the neck.

The axillary plexus of nerves 1, described in page 55 of Part II., divides above the clavicle, as seen in Plates VII., VIII., and IX. of Part II., marked with the digit 9, into several nerves, which, in their descent to the axilla, encircle the axillary artery H,* uniting with each other; and when emerging from the axilla, they again separate into distinct nerves; some, however, take their origin above the clavicle, as the supra-scapular, the subscapular, and the thoracic nerves. The thoracic nerves are small twigs very variable in number, proceeding under the clavicle to the greater pectoral muscle C, which, as well as the lesser pectoral D, they supply, and afterwards pierce, to be distributed on the mammary gland and skin; one of these small nerves is seen in Plate IX., Part II., descending parallel to the posterior external jugular vein D, while two are observed in Plate XI., *Fig.* 1, marked with the digits 7, descending in the axilla to the latissimus dorsi E. The supra-scapular, or simply the scapular 8, of *Fig.* 1, Plate XII., accompanies the supra-scapular artery 51, supplying the supra-spinatus, infra-spinatus, teres minor, and subscapularis muscles. The subscapular or axillary nerve descends into the axilla, the glands and skin of which it supplies, and the rhomboidei and latissimus dorsi muscles; but its chief twig accompanies the posterior circumflex artery d, as seen in *Figs.* 1, Plates XI. and XII., and supplies the teres minor and deltoid muscles.

The nerves which descend on the arm, are the external cutaneous 3, the internal cutaneous 4, the median 2, the

* The axillary plexus of nerves embracing the axillary artery is one of the objections to attempting to secure the artery in this part.

ulnar 5, the spiral 6, and the cutaneous of Wrisberg 9, as seen in *Fig.* 1, Plate XI. The internal cutaneous nerve 4, situated very superficially, generally over the brachial vein u, is seen to take its origin from the plexus in the axilla, and to descend on the brachial vein u, giving off numerous nervous threads in its course to the bend of the arm, where its twigs twine in an elegant manner round the basilic vein q and its median branch t, proceeding downwards on the ulnar aspect of the fore-arm to the carpus.* The nervous threads which supply the skin, divide and meander in a most beautiful serpentine manner, and ultimately become so soft as to be incapable of dissection. The cutaneous of Wrisberg 9, a delicate nerve, descends on the internal or ulnar aspect of the arm, sometimes deriving its origin from the axillary plexus, sometimes from the ulnar nerve, and sometimes from one of the intercostal nerves of the thorax; for, as much irregularity and variation occur in the distribution of the axillary plexus of nerves, as in the veins of the arm, the student should therefore be prepared to find a different arrangement in each extremity he dissects. This cutaneous of Wrisberg I have confined to the continuation or branch of one of the intercostal nerves,† which is observed to descend on the triceps muscle G, g, g, which it supplies in its course downwards to the elbow-joint, where it commonly unites with the ulnar and internal cutaneous nerves. Besides this nerve, other intercosto-humeral nerves, marked 9, are seen distributed on the axillary glands *a*, the plexus of vessels, skin, and muscles, which have been described in Part II., page 16. The external

* The course of these nervous threads and the basilic vein should be considered when dividing the fascia l of the biceps, in the event of matter being lodged beneath.

† Named also intercosto-humeral nerves.

cutaneous nerve 3* pierces the coraco-brachialis muscle K,† descends beneath the biceps muscle L, resting on the brachieus internus muscle, and appears at the bend of the arm, on the radial margin of the biceps, where it becomes more cutaneous, and encircles the cephalic vein r, which it accompanies down the fore-arm to the thumb. In this course it gives origin to twigs that supply the coraco-brachialis, the biceps, the brachieus internus, the supinator radii longus N, and the flexor carpi radialis muscles; twigs to the cephalic vein, and twigs to the integuments; and unites with the cutaneous twig of the spiral nerve.

The median nerve 2‡ is observed to descend superficially on the brachial artery h, to the bend of the arm, where it runs a little ulnad, and dips beneath the pronator radii teres I, the flexor carpi radialis P, the palmaris longus Q, and the flexor digitorum sublimis R muscles; then descends between the latter and the flexor digitorum profundus muscle w to the carpus, running on the radial edge of the sublimis,§ under the annular ligament U, and dividing into twigs which, like the volar branches of the ulnar artery, descend between the metacarpal bones, and subdivide into a digito-radial and a digito-ulnar to each finger, beginning from the thumb to the ring-finger, the latter of which has only its radial side supplied by this nerve, the ulnar being supplied by the ulnar nerve. These digital twigs run along the sides of

* Also named the musculo-cutaneous, and perforans Casserii.

† The nerve is represented in the plate with a few scattered fibres of the coraco-brachialis muscle over it, in order that the course of the nerve might be seen.

‡ Also named radial. The relation of this nerve to the artery should be considered when securing the latter.

§ The course of the median nerve at this part should be considered with regar to its division, when any of its twigs distributed on the fingers are attacked wi neuralgia.

the fingers to the tips or apices, and subdivide into most minute threads, which end in delicate pulpy points, and these, with the arteries, form a most beautiful arrangement for the seat of sensation. The median nerve, in this course, gives origin to a number of twigs to the brachial artery and vein, to the different muscles already mentioned, to the flexor longus pollicis x, the abductor pollicis y, the flexor brevis pollicis z, the flexor ossis metacarpi pollicis 52, and the adductor pollicis w, and also to the lumbricales muscles. Where the median nerve passes beneath or pierces the flexor muscles at the bend of the arm, it gives origin to a branch 12, of some magnitude, named interosseal, which accompanies the interosseous artery p, and supplies the flexor longus pollicis muscle x, the pronator quadratus muscle 50, and the interosseous ligament. In the palm of the hand immediately distad to the annular ligament u, the median nerve is observed to give origin to a twig that communicates with the ulnar nerve 5; and as the digital twigs run along the sides of the fingers, they give origin to numerous threads.

The ulnar nerve 5* is observed to pass behind the axillary vein *u*, and to descend on the two distal heads of the triceps muscle *g*, *g*, to the inner condyle of the os brachii, on the anconal aspect of which, it runs between the condyle and the olecranon of the ulna; and afterwards appears on the thenal or palmar aspect of the fore-arm, as seen in *Figs.* 2, Plates XI. and XII., having pierced between the flexor carpi ulnaris s, and the flexor digitorum sublimis r, between which muscles it proceeds, resting on the flexor profundus w, to the carpus, where it runs on the radial aspect of the pisiform t, in company

* Also named nervus cubitalis.

with the ulnar artery *h*, and superficially to the annular ligament U. In the palm of the hand the nerve divides into two volar branches, one of which subdivides like the median into a digito-ulnar of the ring-finger, and a digito-radial of the little finger; while the other volar branch subdivides into twigs that supply the ulnar side of the little finger and muscles of the same finger, as the abductor minimi digiti 51, the flexor parvus minimi digiti 52, and the adductor minimi digiti. From the palmar or volar portion of the nerve, a deep twig proceeds that generally pierces the adductor minimi digiti muscle, and supplies the deep volar arterial arch of the radial artery *o*, the interossei and the lumbricales muscles, and sometimes the adductor pollicis muscle *x*. The ulnar nerve in its course along the arm, generally gives origin to twigs that supply the skin, one of which commonly unites with the cutaneous nerve of Wrisberg, and to a twig which usually unites with the spiral nerve 6; in its course along the fore-arm, the same nerve gives origin to a number of twigs that supply the flexor carpi ulnaris S, the flexor digitorum sublimis R, and the flexor digitorum profundus W muscles, also to twigs supplying the ulnar artery;* near the pronator quadratus muscle 50, the ulnar nerve gives origin to its dorsal or anconal branch 15, which descends beneath the flexor carpi ulnaris muscle S, to the anconal or dorsal aspect of the hand, where, as seen in Plate XIII., it divides into a number of cutaneous threads, that extend to the fingers, supplying in their course the posterior portion of the annular ligament U, the tendons of the extensor carpi ulnaris muscle B, the extensor digitorum communis muscle D; and uniting with each other,

* The relation of the ulnar nerve to the ulnar artery should be considered when securing this vessel.

and also with the cutaneous threads 46 of the spiral nerve.

The spiral nerve* 6, *Fig.* 1, Plate XI. emerges from the axilla beneath the axillary plexus of vessels, descends on the first G, and second g heads of the triceps, and runs between the second g, and third g heads, in company with the arteria profunda superior f, around the os brachii to the outer or radial aspect of the arm, where, as seen in Plate XII., *Fig.* 1, it descends between the brachieus internus M, and supinator radii longus N muscles, resting on the extensor carpi radialis longior, and the supinator radii brevis muscles. Here, as seen in Plate XII., *Fig.* 2, and Plate XI., *Fig.* 2, the nerve divides into a cutaneous 16, and deep branch 26; the former, 16, passes near the radial artery o,† on the radial aspect of which, descending on the fore-arm to the distal third, it runs beneath the tendon of the supinator radii longus muscle N to its anconal edge, and after a short course subdivides into a thenal or palmar 36, and an anconal or dorsal twig marked 46; the former or thenal of the two latter, marked 36, descends on the radial margin of the fore-arm to the abductor muscle Y, the flexor of the metacarpal bone 52, and the integuments of the thumb; and the latter or anconal, marked 46 in Plate XIII., descends on the anconal or dorsal aspect of the thumb, fore-finger, and middle finger, supplying the extensors and integuments, and uniting with the twigs of the anconal branch 15 of the ulnar nerve. The deep branch 26, *Fig.* 2, Plate XII., of the first division, pierces the supinator radii brevis to the anconal aspect, and supplies the supinators and extensors

* Also named radial and spiral-muscular nerve.

† The relation of the cutaneous branch of the spiral nerve to the radial artery should be considered when cutting down to this artery when wounded.

of the hand. At its emergence from the axilla, the spiral nerve gives origin to twigs supplying the triceps muscle and the skin; in its course between the second and third heads of the triceps, to twigs also supplying the muscle; and on its appearance at the radial aspect, gives off cutaneous twigs, some of which supply the cephalic vein.

BLOOD-VESSELS AND NERVES

OF THE

PELVIS AND LOWER EXTREMITY.

PLATE XIV. represents a section of the male pelvis, A the symphysis pubis, B the sacrum bisected longitudinally, C the os coccygis, m the urinary bladder, *n* a catheter introduced into the urethra onwards to the bladder, the continuation of the instrument being represented by dotted lines, and w the ureter of the right side entering the bladder. The letters o, are placed on the acceleratores urinæ muscles; p on the erector penis muscle of the left side, that of the right side being detached to bring into view the corpus cavernosum penis X; q on the transversus perinei muscle of the left side, that of the right being truncated and marked q; r on the sphincter ani muscle surrounding the anus I, the two other letters I being on the rectum; s, s on the levator ani muscle, the right half being cut across to bring into view the prostate gland t, and vesiculæ seminales u. The letter y indicates the gluteus maximus muscle, v the vas deferens, and the white line descending between the rectum I and the blad-

der m, and afterwards ascending on the fundus of the latter to line the abdominal muscles, represents the peritoneum.

The internal pudic artery *h*, seen in Plate VI. of Part II., to be a branch of the internal iliac, and described in page 34 of the same Part, is observed in Plate XIV., after its re-entrance into the pelvis, to ascend on the left side, on the tuber G and ramus ischii and pubis, behind the transversus perinei muscle q to the angle formed by the erector penis p and accelerator urinæ o muscles,* where it divides into the artery 1 of the corpus spongiosum urethræ, the artery 2 of the corpus cavernosum penis, and the arteria dorsalis penis 3, which branches are distinctly seen on the right side, the trunk of the internal pudic artery *h* being cut off near this division. The arteria dorsalis penis 3, considered as the continuation of the trunk, ascends on the ramus to the symphysis pubis, and turns suddenly on the atlantal surface of the penis, on which it runs onwards under the integuments to the glans, accompanied by its nerve, and separated from the artery and nerve of the opposite side by the vena dorsalis penis 60, as seen in Plate XVI. The branch 2 supplying the corpus cavernosum penis X, enters this body, and runs to its further extremity at the glans, giving off numerous twigs, some of which communicate through the septum with those of the artery of the opposite side, as represented by dotted lines in Plate XIV. The artery 1 supplying the corpus spongiosum urethræ, enters at the bulb which is

* The course of the internal pudic artery, along the ramus of the ischium and pubes, where, however, there is a strong protection of a dense aponeurosis, should be considered by the surgeon in the lateral operation of lithotomy. No branches of the artery, excepting the transversalis perinei, and the external hemorrhoidal, should be wounded; and no muscles, excepting the transversus perinei, the levator ani, and the gluteus maximus, ought to be cut in this lateral operation.

immediately beneath the letter o on the right side.* Besides these branches, the internal pudic artery within the pelvis, gives origin to small branches that supply the prostate gland t, the vesiculæ seminalis u, and the urinary bladder m; and where it emerges out of the pelvis at the great sacro-ischiadic notch D, Plate XVII., and winds round between the long sacro-ischiadic ligament H, and the short ligament, this artery commonly sends small branches to the pyriformis A, the obturator internus with the gemelli x, and the gluteus maximus F muscles; also to the tuberosity of the ischium z, and the coccyx c. Where the artery re-enters the pelvis, as seen in Plate XIV., it gives origin to the external hemorrhoidal branch *r* that supplies the rectum I, to branches supplying the levator s and sphincter ani r muscles, the cellular substance that fills up the cavity between the rectum I and the tuberosity of the ischium G; to a branch which is observed to run above the transversus perinei muscle q, and afterwards to ascend on the accelerator urinæ muscle o, denominated arteria transversalis perinei; to branches supplying the erector penis muscle p, and to branches supplying the scrotum Z that anastomose with the spermatic artery, and the pudic branches of the femoral artery. All these branches of the pudic artery, though far from being regular, have had specific names given them, either from the importance of the objects they supply, or from the relation they have to operative surgery.

The internal pudic nerve, seen in Plate VI. of Part II., and described in page 36 of the same Part, is observed in Plate XIV. accompanying the internal pudic artery *h* and

* This is the artery which is most liable to be wounded in the lateral operation of lithotomy, when the deeper incisions are made anterior and superior, or dermal and pubic, to the membranous portion of the urethra.

its branches, and its dorsal twig accompanying the dorsal branch 3 of the artery, the further distribution of which latter is seen in Plate XVI., where the nerve subdivides into small threads that supply the artery, vein, and integuments on the dorsum of the penis. In Plate XIV., its inferior twig is observed supplying the erector penis muscle p, the accelerator urinæ muscle o, and the corpus spongiosum urethræ, advancing to the root of the glans, and ending in the prepuce. The internal pudic nerve unites with twigs of the anterior crural nerve. The trunks of the internal pudic nerve and artery are observed attended by a vena comes, which ultimately re-enters the pelvis and joins the internal iliac vein, as seen in Plate XVII., where the course of the nerve out and into the pelvis is also seen. The vena dorsalis penis, or vena magna ipsius penis 60, Plate XVI., returns the blood circulated by the arteriæ dorsalis penis 3, 3, runs in the groove between the corpora cavernosa penis, to the symphysis pubis, under which, continuing its course to the neck of the urinary bladder, it forms a plexus, as seen in Plate XIV., that ultimately concentrates and joins the internal iliac or hypogastric vein x, Plate VI. Part II.; inosculating at the root of the penis with the internal pudic vein. In Plate XVI., the distribution of the spermatic artery *g*, *g*, is observed on the spermatic cord, after its emergence at the inguinal canal; the commencement being described in page 23, and represented in Plate VI. of Part II. Within the abdominal cavity, or in the inguinal canal, the spermatic artery generally divides into two branches that descend on the spermatic cord, beneath the cremaster muscle, supplying the vas deferens l, the spermatic veins, and spermatic plexus of nerves, downwards to the epidydymis *r*, and testis r, entering the organ where the tunica vaginalis unites with the tunica albuginea; and in this

course anastomosing with the spermatic branch of the epigastric, and with branches of the pudic arteries on the scrotum.

In Plate XIV. the ultimate distribution of the internal hemorrhoidal artery *b*, the continuation of the inferior mesenteric artery b, seen in Plate V., Part II., and described in page 21 of the same Part, is observed descending on the rectum I., in company with the continuation of the inferior mesenteric plexus of the splanchnic nerves, described in page 30 of Part II.

The truncated nerve, marked 4, which is observed to be distributed on the vesiculæ seminales u, the prostate gland t, the urinary bladder m, and the levator ani muscle s, is generally formed by the union of twigs from the third and fourth sacral nerves.

The distribution of the other branches of the internal iliac artery mentioned in page 33 of Part II., and seen in Plate VI. of the same Part, is displayed in Plate XVII., with the exception of the obturator artery, which, as soon as it emerges from the pelvis at the thyroid foramen along with the obturator nerve, divides into small branches that supply the obturator externus muscle, the three heads of the triceps muscle, the quadratus femoris muscle, the capsular ligament and hip-joint, anastomosing with the internal circumflex, the ischiadic, and the internal pudic arteries. The gluteal artery *c* is observed emerging at the great sacro-ischiadic notch D,* along with the ischia-

* When the gluteal artery is wounded, the patient should be placed on his face, the limb extended, and the toes turned tibiad; a line then drawn from the posterior superior spinous process of the os ilium b, downwards between the tuberosity of the os ischium z, and the trochanter major of the os femoris, is to be divided into three proportional parts, when the operator may depend on finding the artery emerging out of the pelvis at one-third from the spinous process of the os ilium and two from the centre of a transverse line extending between the mesial of tl

dic *f*, and internal pudic *h* arteries, the great sacro-ischiadic nerve 20, and the pyriformis muscle, A; the arteries are accompanied by their corresponding veins. The gluteal artery immediately divides into several branches that supply the glutei muscles, as the maximus F, the medius I, and the minimus, with several other contiguous muscles; and these branches anastomose with the ischiadic, the external circumflex of the profunda femoris, the circumflex iliac, and the last of the lumbar arteries.

The ischiadic artery† *f* emerges from the pelvic cavity at the same notch with the gluteal, being separated by the pyriformis muscle A, and like the latter, divides into several branches which supply the gluteus maximus and medius, the obturator internus with the gemelli x, and the quadratus femoris K muscles, the great sacro-ischiadic nerve 20, the long sacro-ischiadic ligament H, the tuberosity of the os ichium z, and the long head of the biceps flexor cruris L, the semi-tendinosus M, and the semi-membranosus N muscles, where they arise from this portuberance. The ischiadic artery inosculates with the obturator, internal

tuberosity of the os ischium, and the tibial edge of the trochanter major. But as an incision in this direction would cut obliquely across the fibres of the gluteus maximus, it is preferable to make the incision more across from the sacrum B to the trochanter major in the line of the fibres of this muscle, keeping in view the point where the artery emerges from the pelvis, the extent of the incision depending on the fatness and muscularity of the patient; however, in all cases the first two may be boldly executed—the rest with more delicacy. The dissecting forceps will be found the best instrument to seize the artery.

† Also named sciatic. When this artery is wounded, the same position of the patient and measurement as for the gluteal artery are required, with this difference, that the line should approach nearer the tuberosity of the ischium than the trochanter major of the os femoris, and should be divided into two, in place of three proportional parts, as the artery emerges out of the pelvis at the central point. The line of incision should be the same, and fully as extensive. Great care must be bestowed not to injure the great sacro-ischiadic nerve 20.

pudic, gluteal, and internal circumflex branch of the profunda femoris, arteries.

The external iliac artery T of Plate VI., Part II., is described to its emergence out of the abdomen, in page 27 of the same Part, and in Plate XV. is observed to run beneath Paupart's ligament B, nearly in the centre between the os pubis A, and the anterior superior spinous process of the os ilium C, having the anterior crural nerve 22 on its iliac side, and the femoral vein U on its pubic side,* and resting on the psoas magnus and iliacus internus

* When the femoral artery requires to be secured in the groin, the patient should be placed on a low bed, sofa, or table, with the feet at right angles to each other, but the affected removed or separated from the sound limb. The space between the anterior superior spinous process of the os ilium, and the spine of the os pubis, is to be divided into ten proportional parts, when five and a half measured from the pubes, and four and a half from the ilium, will indicate the point where the artery emerges from the abdomen; which point therefore becomes the centre of an incision that is to be made through the skin and cellular substance, in the course of the artery within and without the abdomen; calculating the course of the vessel, as described in page 25 of Part II. The deeper incisions, atlantad to Paupart's ligament, should not wound the external oblique, or any of the lateral muscles of the abdomen; but those distad to the ligament must extend through the fascia superficialis and fascia lata, the latter of which should be carefully cut, as the vessel lies immediately beneath or centrad. The knife ought to be lateralized with its cutting edge to the os ilium, in order to avoid the femoral vein; and for the same reason, the aneurismal needle should be inserted between the vein and artery, and brought out between the artery and nerve. As small threads of the anterior crural nerve are frequently distributed on the artery, the latter should be divested of them before surrounding it with a ligature. These measurements of Mr. Walker are more valuable here than elsewhere; for there is no object like the first rib, or muscle like the scalenus anticus, to direct the operator, as in the operation for securing the subclavian artery: besides, the patient may be very fat, or the limb œdematous, the latter of which is a common occurrence in aneurism. Again, the femoral artery sometimes divides into two, sometimes into three equally sized branches, which descend parallel to each other for some extent down the limb. A lymphatic gland occasionally lies over the artery, which should be kept in view by the operator, as they generally become enlarged when situated over the vessel in aneurism. In this view of the parts, Plate XV., the integuments and part of the fascia lata are merely removed, for the pubic portion D covering the pectinalis and triceps muscles

muscles. Here the artery assumes the name of femoral,* descends down the superior third of the thigh, and runs obliquely beneath the sartorius muscle E, resting on the triceps muscle *g*, g, G, which it pierces where the three heads form the tendon, near the distal third of the thigh, as seen in Plates XVI. and XVII.; in this course the artery gives origin to several branches, apparently to the epigastric x, and the circumflex iliac *c* seen in Plate XV., both of which, however, commonly arise within the abdominal cavity; which was the case in the subject when the parts were undisturbed, as described in pages 19 and 27 of Part II. With regard to the origin of the epigastric artery, it is sometimes a branch of the profunda femoris; and I have seen the epigastric giving origin to the circumflex iliac artery. The epigastric artery is observed in Plate XV. to give origin to a branch *x* that descends in the inguinal canal, where it is represented by dotted lines, and divides into two small branches which run superficially on the spermatic cord, along the cremaster muscle a, to the tunica vaginalis b of the testis; the scrotum z, and the dartos, anastomosing with the branches of the spermatic and the internal pudic arteries. A number of small arterial branches named inguinal are seen running across from the tibial side of the femoral artery to the lymphatic inguinal glands, letters *a*, and one marked f is observed to extend across the pubic portion D of the fascia lata, to the spermatic cord and scrotum, anastomosing with the branches of the epigastric, spermatic, and internal pudic

is left, also that portion of the fascia covering the rectus femoris and vasti muscles. The parts therefore are not insulated, in order that the anatomy of aneurism of the femoral, the superficial femoral, and the popliteal arteries may be displayed in a naturally connected manner.

* Also named crural artery, inguinal portion of crural artery, and common femoral artery.

arteries. All these are extremely irregular in number, origin, and distribution. Branches are observed to proceed from the opposite side of the femoral artery to the sartorius muscle E; and the largest is termed the profunda femoris c, seen only in Plate XVI. The profunda generally branches off, as here delineated, but great irregularity exists; for I have already mentioned, that the common femoral sometimes divides into two branches on its emergence from the abdomen, and sometimes not until as far distad as its descent to the sartorius muscle.* In Plate

* When the popliteal artery T of Plate XVII. is affected with aneurism, the superficial femoral artery t of Plate XVI. is secured, in order that the vessel may be healthy enough to ensure adhesion, and because the artery is more easily reached. The position of the patient and the measurement are so far the same as those directed for securing the common femoral; the five and a half proportional parts from the spine of the os pubis are made the base of an equilateral triangle, which is to be constructed downwards on the thigh, the apex being therefore distal, the base proximal; and the outer or iliac side of this triangle should be extended downwards from the apex twice its length, when the artery will be found to run beneath this line throughout. But the difficulty, in a pathological point of view, is to calculate where the profunda branches off, for it is ascertained, that if an artery be tied too contiguous to a large branch, no clot of blood can form, as this fluid coagulates by its motion being impeded, and that no contraction of the artery can take place, its sides being kept distended with the blood from the impetus of the stream striking equally on both vessels; while, as we have mentioned in the text, great irregularity existing in the division of the common femoral, we can only endeavour to secure the artery as remote as possible from the groin, and as far as possible from the disease. An incision, therefore, should commence at the apex of the triangle, the point where the profunda commonly takes its origin, and be continued down the thigh proportionally to the depth of skin and cellular substance of the patient; a second incision, equal in length to the first, should cut through the fascia lata, and this cautiously, when the pulsation of the artery will be felt; a few scratches with the nail of the finger or handle of the scalpel will then denude the artery sufficiently to enable the operator to insert the aneurismal needle between the vessel and the vein on the tibial side, and to carry it around the artery towards the fibular aspect. As one or two nervous twigs, one of which is the saphenus, run spirally along the artery at this part, as observed in Plates XV. and XVI., care should be taken to exclude them; but if this be difficult to be accomplished, they should be cut across with the knife and forceps, and on no account included in the

XVI. the profunda c branches off on the fibular aspect of the femoral artery T; descends deep among the muscles behind and towards the outer side, or centrad and fibulad of the femoral artery T, t, resting between the vastus internus L and the adductor brevis *g* muscles; pierces the triceps between this latter head and the adductor longus g, close to the linea aspera of the os femoris; and appears on the popliteal aspect of the limb, distributing branches to the long head L of the biceps, the semi-tendinosus M, and the semi-membranosus N muscles, as seen in Plate XVII., and anastomosing with the ischiadic artery. By some, this continuation of the profunda artery is considered the long deep perforant.*

In this course the profunda gives origin to several branches, which are named the internal circumflex d, the external circumflex e, and the perforants.† The first, or

noose of the ligature. When the scalpel is employed to separate the artery and vein, which adhere in this region very closely by thick tough membrane, the cutting edge should be lateralized fibulad, in order to avoid wounding the vein.

* This branch should be considered in relation to amputation of the thigh, as it is very regular in its direction.

† When amputation at the hip-joint is requisite, the patient should be placed on a low table, with his nates resting on the edge, and his toes turned outwards or fibulad, the limb being supported by an assistant. The surgeon then transfixes the thigh with a catling in the angle formed by the shaft and neck of the os femoris, a little distad to the trochanter minor *f*, *Figs.* 3 and 4, Plate VIII., Part I., in order to avoid this process, and cuts downwards or distad along the inner or tibial margin of the bone sufficiently to enable the assistant to insinuate his thumb between the latter and the inside of the thigh, so as to compress the femoral artery with its branches. The operator now cuts from the bone inwards and downwards, or tibiad and distad, to make an inner flap proportional to the surface which is shortly to be exposed. This flap being held firmly aside, the operator cuts the psoas and iliacus internus muscles, the capsular ligament, and the round ligament, when the joint is so far dislocated as to enable him to carry the instrument through the remainder of the capsular ligament, the quadratus femoris, the pyriformis, the obturator, and gemelli muscles, and around the trochanter major, so as to cut across the rectus femoris, the tensor vaginæ femoris, and the glutei muscles and

internal circumflex* d, is always present, but not always a branch of the profunda femoris; deriving its origin almost as frequently from the common femoral. This circumflex branch descends with its concomitant vein behind the femoral vein U, between the pectinalis F, and psoas magnus and iliacus internus W muscles, to the capsular ligament, where it divides into several muscular branches that supply the commencement of the adductor magnus G, the quadratus femoris K, the gemelli with the obturator internus X, the long head of the biceps L, the semi-tendinosus M, and the semi-membranosus N muscles, also the tuberosity of the ischium Z, as seen in Plates XVI. and XVII.; in this course the artery naturally gives origin to branches that are distributed on the psoas and iliacus internus w, the pectineus F, the adductor longus g, the adductor brevis g, and the obturator externus muscles; also on the scrotum, the capsular ligament, and the interior of the hip-joint. The internal circumflex artery anastomoses with branches of the different pudic, branches of the obturator, of the ischiadic, and the gluteal, arteries.

The external circumflex artery† e, generally a conjoint branch with some of the perforants, runs on the vasti L, O, and the crureus P muscles, beneath the rectus

skin, making the outer correspond with the inner flap. The femoral artery may be secured either at this stage of the operation, or immediately after the completion of the inner flap, which should depend on the abilities of the assistant. The other arteries, as the profunda with its branches, and the ischiadic, may be secured at the end of the operation. The muscles cut across in the performance of the inner flap, are the pectinalis, the three heads of the triceps, the long head of the biceps, the semi-tendinosus, the semi-membranosus, and the gracilis. Part of the great head of the triceps, the long head of the biceps, the semi-tendinosus, and the semi-membranosus muscles, are sometimes cut in the performance of the outer flap.

* Also named circumflexa major.

† Also named circumflexa minor.

femoris I, the tensor vaginæ femoris K, and the gluteus medius muscles, where it anastomoses with a branch of the gluteal artery. In this course, branches proceed to the iliacus internus muscle, the gluteus minimus muscle, the trochanter major, anastomosing with the internal circumflex and perforating branches of the arteria profunda femoris. The perforating branches of the profunda are merely the continuous trunk, as already described, with its branches, which are observed in Plate XVI. descending on the muscles, as the rectus I, the vastus externus O, the crureus P, the vastus internus L, and the different heads of the triceps G, g, *g*. Other and smaller branches are given off to the psoas magnus and iliacus internus W, and the pectineus F muscles.

I have hitherto been describing the femoral artery as continuous to the popples, which no doubt is the case; but as it either changes its name, or actually divides into two branches, one of which, the profunda, has been detailed, we have now to consider the artery, from the point of its giving off the profunda, to the popples, as the superficial femoral artery.* The course of this artery, and its relation to surgery, have already been described; we have therefore only to consider its branches, which on examining Plates XV. and XVI., are observed to be very few and small; and are merely muscular and cutaneous branches, with one *a*, at its distal region, named the anastomoticus. The muscular branches are seen to be distributed on the sartorius E, the vastus internus L, and the gracilis Q; and near where the anastomoticus *a* takes its origin, branches proceed to the biceps and vastus internus muscles, which are termed perforants. The anastomoticus *a*, descends generally towards the patella, and branches out to supply

* Named also the femoro-tibial portion of the crural artery.

the tendons and ligaments on the patellar aspect of the knee-joint, and the fascia of the leg.

The superficial femoral artery having pierced the tendon formed by the three heads of the triceps muscle, and running close round the os femoris, appears in the popleS, assumes the name of popliteal, which artery marked T, Plate XVII., descends deeply nearly in the centre of the ham, between the hamstring muscles, and between the condyles of the os femoris, also beneath and in the centre of the two outer heads, R, R, and the two inner heads r, r, of the gastrocnemius muscle, to the distal margin of the popliteus muscle v, where it divides into two large branches, the anterior tibial *t*, and the posterior tibial t, Plates XIX. and XX.* In this course, the popliteal artery gives origin

* When the popliteal artery is wounded, it appears preferable, from its depth, and from the popliteal or posterior tibial nerve 28, and the popliteal vein v, lying superficially to it, the latter of which is intimately connected with the artery by thick tough cellular membrane, to apply compression to the wound, and throw a ligature around the superficial femoral artery, as described in page 110, unless the wound be large enough to enable the operator to secure the artery with facility. Should the surgeon, however, consider it his duty to secure the popliteal artery, the patient should be placed on his face, and the toes turned neither tibiad nor fibulad; and an incision proportional in length to the age and fatness of the individual, is then to be made in the centre between the two sides of this distal third of the thigh, through the skin and cellular substance, which is here very adipose and very abundant, and fills up this triangular cavity of the popleS. The first incision may be bold, and will require to extend fully the distal third of the thigh; the second incision may be nearly equally bold, and should extend through the fascia and more of the cellular substance, when the popliteal nerve will present itself at the proximal part of the wound, where it runs more superficially or dermad; for at the distal portion the nerve lies a little outwards or fibulad. The operator now proceeds with more caution, lateralizing the knife tibiad if he continue its employment, in order to avoid the vein that runs along the artery, a little fibulad proximad, but dermad in the distal portion; the fingers, however, will be found easily capable of removing aside the fatty substance now remaining over the vein and artery, which, being denuded for a little space, the aneurismal needle is inserted on the tibial aspect of the vein, between it and the artery, around the latter of which it is carried to the tibial aspect. An artery should be disturbed and

to several branches to the hamstring muscles, the gastrocnemii muscles, and the knee-joint, the latter of which are styled articular. Several branches are observed in Plate XVII. to proceed from each side of the artery to the semi-membranosus N, the semi-tendinosus M, the gracilis Q, and the biceps L muscles, the short head of the latter of which is marked with a roman l. The other lateral branches are the articular, which are divided into two superior articular,* two inferior articular,† and an azygos articular,‡ the latter of which, however, takes its origin from the centre of the popliteal aspect of the vessel; but these are seldom, if ever, regular in their number, therefore I have not marked them: they run around and into the centre of the knee-joint, anostomosing with each other, with the anastomoticus and the perforating branches of the superficial femoral, and with the recurrent of the anterior tibial arteries, as seen in Plates XV. and XVI., rendering the joint very vascular; which should be considered attentively by the practitioner in the diseases of this articulation. The superior articulars in this course give origin to branches that supply the vasti muscles, and the inferior articulars send branches to the popliteus, the gastrocnemius, and the tendons of the hamstring muscles. Between the superior and inferior articulars, branches marked *a*, *a*, are observed to take their origin from the

insulated as little as possible, and therefore, when practicable, the aneurismal needle should be employed to separate the artery from the vein, which in all cases, even in this, where the bond of union between these vessels is strongest, will be found sufficient. The needle should not therefore have a piercing or cutting point. In Plate XVII. the drawing represents the limb in an oblique position, or the limb is placed in a tibio-popliteal attitude, to bring into view the different objects in the ham.

* Also named proximo-articulars.

† Termed also disto-articulars.

‡ Also denominated arteria articularis media.

popliteal artery, and to descend on the outer heads R R, of the gastrocnemius, near the tendo-achillis *r*, as seen in Plate XIX., and are named rami gastrocnemii from their regularity.

In Plate XX. the popliteal artery T is seen to divide into the anterior tibial, italic *t*, and the posterior tibial, roman t, the latter of which is considered the continuation of the trunk. The anterior tibial artery *t* is observed to run between the distal extremity of the popliteus muscle v and the tibial head r of the gastrocnemius muscle, where it passes through an aperture in the interosseous ligament, and arrives at the anterior or patellar aspect of the leg, as seen in Plate XVIII.; here the artery is perceived to descend between the extensor longus digitorum pedis B and the tibialis anticus A muscles for a short distance, and then between the latter muscle and the extensor proprius pollicis pedis muscle c* to the tarsus, where the last muscle crosses the artery which continues to descend on the foot between the metatarsal bones of the great toe and the index toe, running beneath the extensor digitorum brevis muscle E; lastly, the artery dips between these metatarsal bones, and descends into the sole of the foot, to inosculate with the external plantar branch *a* of the posterior tibial artery t. Before the anterior tibial artery *t* leaves

* When the anterior tibial artery becomes the seat of operation, the patient should be laid on a bed or table, with the foot resting on the heel, and the toes turned neither tibiad nor fibulad. An incision proportional to the part of the leg where the artery is to be secured, and to the age and muscularity of the individual, is then to be made through the skin, cellular substance, and fascia, and between the tibialis anticus A, and the extensor longus digitorum B, if in the proximal third of the leg, and between the former muscle, and the extensor pollicis C, if in the two distal thirds of the leg. The anterior tibial nerve 28 first presents itself, which, being held aside, the aneurismal needle may be introduced on either side of the artery, this vessel being previously separated from its two concomitant veins.

the popliteal aspect of the leg, it gives origin to numerous branches supplying the heads of the gastrocnemius and tibialis posticus a, muscles, and the capsular ligament, those distributed on the latter inosculating with the azygos and the inferior articulars; in the patellar aspect the artery sends off its recurrent *d*, that ascends between the tibialis anticus A, and the extensor digitorum longus B muscles, supplying them in its course to the knee-joint, nourishing the articulation, and inosculating with the inferior articulars; in the course of the artery to the tarsus, a number of branches are observed proceeding to the tibialis anticus A, the extensor longus digitorum B, and the extensor proprius pollicis pedis G muscles, some of them piercing the interosseous ligament to inosculate with the branches of the posterior tibial artery. Where the artery runs beneath the annular ligament D, two branches c, c, take their origin, and are distributed around the malleoli s, s, hence named malleolares: after emerging beyond the annular ligament D, and running along the fibular edge of the extensor pollicis muscle C, three branches, marked with the letters e, are seen to take their origin, and to run across the foot, some superficially to the extensor digitorum brevis muscle E, and others beneath it, forming arches somewhat similar to the arteries in the palm of the hand; from these irregular arches, branches proceed between the metatarsal bones, subdividing into digital branches, that supply the toes; while those which extend to the fibular aspect of the foot inosculate with branches of the external plantar artery. The artery that extends across the tarsus is named by Haller tarsea, and the one across the metatarsus, arteria metatarsea; but as they are very irregular, they do not seem entitled to so dignified appellations. Where the artery *t* is descending to the sole of the foot, between the metatarsal

bone of the great toe and the index pedis, a branch *f* is observed to derive its origin, and to proceed onwards in the interstice between these toes, dividing into a branch supplying each toe, a digito-fibular of the great toe, and a digito-tibial of the index pedis.

The posterior tibial artery t, Plates XX. and XIX., descends deep on the popliteal aspect of the leg, beneath the inner heads r, r, of the gastrocnemius, and resting on the flexor longus digitorum pedis o, or rather between it and the flexor pollicis longus A,* downwards to the tarsus, where the artery divides into the internal or tibial plantar *c*, and the external or fibular plantar *a* branches, both of which are observed to run beneath the abductor pollicis muscle B; the internal *c* proceeding along its fibu-

* In place of cutting down to the posterior tibial artery, when wounded in the two proximal thirds of its course, it appears preferable, from the depth of the vessel and the dismemberment of important muscles that would necessarily result, to apply compression to the artery, and throw a ligature around the superficial femoral artery. When wounded in the distal third of the limb, the patient should be placed on his face, and the toes turned neither tibiad nor fibulad, but distad, to relax the muscles; an incision must then be made in the centre between the tibial edge of the gastrocnemius muscle, or rather the tendo-achillis *r*, *r*, Plate XIX., and the tibial angle *q*, *q* of the tibia, through the skin and cellular substance, the second incision cautiously cutting through the fascia, investing the muscles and vessels; the artery will then be distinctly felt pulsating, and should be separated from its concomitant veins and the posterior tibial nerve 22, which generally lies on its fibular side, either with the scalpel, its handle, the nail of the finger, or the aneurismal needle, the latter of which ought to be introduced from the fibular aspect, between the nerve and artery, and brought out at the tibial aspect, leaving out, however, the venæ comites. Should the surgeon deem it prudent to cut down for the artery in the two proximal thirds of the limb, the position of the patient should be the same, but the measurement must be between the same angle of the tibia and the mesial line of the popliteal aspect of the leg; an incision of considerable extent, in this centre, proportional to the muscularity of the patient, will then be requisite to be made through the skin, cellular substance, and the two tibial heads and bellies of the gastrocnemius muscle, when the artery will be felt pulsating. The same directions apply to the employment of the aneurismal needle, as in securing the artery lower down.

lar margin, and dividing into several small branches, which extend to the great toe, the index, and the flexor brevis digitorum c, supplying also several other muscles, tendons, and ligaments of the foot, and anastomosing with the external plantar branch and the anterior tibial artery. The external plantar artery *a*, considered the continuation of the posterior tibial, after running beneath the abductor pollicis B, proceeds beneath the flexor brevis digitorum c to its fibular edge, along which it extends a short distance, and again crosses beneath the muscle to its tibial margin, and also beneath the tendons of the flexor longus with the lumbricales, dipping between the interosseous muscle of the middle toe and that of the index toe, to the interstice between the metatarsal bones of the index and pollex pedis, where it gives origin to a branch that unites with the anterior tibial artery, the trunk advancing to the great toe, and dividing into a digito-fibular of the great toe, and a digito-tibial of the index. From the irregular arch* thus formed by the external plantar artery, branches proceed like the volar in the palm of the hand, and subdivide at the partition of the toes into a digito-fibular and digito-tibial to each toe, which extend to the apices, and form a plexus similar to that of the fingers. In this course the external plantar artery is observed to give origin to branches supplying the os calcis D, the plantar fascia Y, the abductor pollicis B, the flexor brevis digitorum c, the abductor minimi digiti pedis F, and the other muscles of the little toe, as well as those of the foot; and to anastomose with the internal plantar and anterior tibial artery.†

* This irregular arch is represented by dotted lines in Plate XX.

† When either of the plantar arteries is wounded, or attacked with aneurism which here generally assumes the character of aneurism by anastomosis, the practice should be to apply compression to the wound, or diseased part, and to secure the posterior tibial artery in the distal third of the leg as directed; but here the operator must not be surprised, if in the one case the hemorrhage should not be

Shortly after the commencement of the posterior tibial artery t, a large branch, denominated the fibular artery, y, is observed to derive its origin from the fibular aspect, and to descend beneath the fibres of the flexor longus pollicis muscle A, downwards to the tarsus,* where it generally pierces the interosseous ligament, and supplies the ankle-joint, the malleoli, and tarsus; and in this course gives origin to several muscular branches, some to the flexor longus pollicis A, the flexor longus digitorum pedis o, the tibialis posticus a, and the interosseous ligament, the latter of which they pierce to supply the muscles on the patellar aspect; others descend behind the external malleolus s, and anastomose with branches of the external plantar artery. Since, irregularity as frequently exists in the distribution of these arteries, as in those of the fore-arm, the student must not be surprised to find a

stopt, and in the other the increased circulation not impeded; for we have seen a free communication established between the posterior and anterior tibial arteries. Should the operator therefore find it requisite to throw a ligature also around the anterior tibial artery, it ought to be done on the patellar aspect of the foot, to make certain that he arrests the source of the blood; for, as mentioned in the text, this part of the foot is not unfrequently supplied by the fibular artery. To attempt cutting down upon either of the plantar arteries, would excite so much inflammation of the fascia plantaris, that the operation would be productive of more harm than good; and the operator might injure some of the flexor tendons.

* When the fibular artery is wounded, the position of the patient's limb is the same as that for securing the posterior tibial artery, and the vessel can only be taken up easily about the middle of the leg. An incision should be made along the fibular edge of the inner gastrocnemius or soleus, which must be pushed tibiad, while the tibial edge of the flexor longus pollicis is held fibulad; the artery will then be felt pulsating, and the aneurismal needle may be passed around the vessel either from the fibular or tibial aspect; the venæ comites ought, if possible, to be separated, and not included in the ligature, as it is an axiom in operative surgery never to throw a ligature round a vein, even when wounded, but to apply compression, for veins are more susceptible of inflammation than arteries, which seems to result from their more delicate texture, and being more plentifully supplied with nerves and arteries; again, they readily transmit the inflammatory action onwards even to the heart, and prove fatal, which appears to arise from their motion being in this direction, and from their circulating inflammatory blood in this course.

different arrangement; I have seen several instances where the fibular artery pierced the interosseous ligament near the tarsus, and usurped the place of the anterior tibial artery, descending downwards on the patellar aspect of the foot to the great toe, the latter or anterior tibial artery being extremely small, and not descending so far as the point where the fibular first appeared on the patellar aspect.

The blood which is circulated by the common femoral artery and its branches, is returned by two sets of veins, a superficial and a deep seated, like those of the upper extremity.

The superficial veins of the lower extremity are two, the saphena major vein *b*, Plates XVIII., XIX., XX., and XV., and the saphena minor *z*, Plates XVIII. and XIX. The saphena major * *b*, Plate XVIII., commences on the patellar aspect of the foot, by small digital branches from the sides and interstices of the toes, where they unite with each other, and with the saphena minor *z* on the tarsus, forming small irregular arches; these branches concentrate into one or two trunks that ascend on the tibial aspect of the great toe, the tarsus,† and the leg, receiving smaller veins as they proceed, and inosculating freely with the lesser saphena *z*, as seen in Plates XVIII. and XIX.; at the knee-joint, the vein consists of one trunk, which ascends more tibiad and poplitead, as observed in Plates XVIII., XVII., and XV., around the articulation, and again appears on the tibio-patellar, or internal and anterior aspect of the thigh, ascending and receiving branches in its course to the groin, where it runs beneath some of the inguinal lymphatic glands *a*,

* Also named saphena interna.

† Where the saphena major ascends on the tibial margin of the patellar aspect of the foot, phlebotomy is sometimes performed; and when the scarificator is employed, the operator must keep in view the course of the anterior tibial artery.

and joins the femoral vein U, passing the iliac K, and pubic portion D of the fascia lata, as seen in Plate XV.: the junction being more distinctly seen in Plate XVI., where the saphena major *b* is truncated.* The saphena runs throughout the whole of its course between the skin and the fascia of the limb. The saphena minor vein *z*, Plate XVIII., commences on the fibular aspect of the foot near the little toe, inosculating with the saphena major vein *b*, runs round the external malleolus S to the popliteal aspect of the leg, and ascends on the tendo-achillis *r*, and outer surface of the gastrocnemius R, inosculating freely with the saphena major vein, as seen in Plate XIX., to the popples, where it joins either the saphena major vein *b*, the popliteal vein U, or continues its ascent, as seen in Plate XVII., under the biceps L and semimembranosus N muscles, and joins one of the venæ comites of the arteria profunda femoris, as was the case in this subject.† In rare occasions, the saphena minor proceeds upwards around the thigh, and joins the saphena major vein near the groin.

The posterior tibial and anterior tibial arteries are observed in Plates XX., XVIII., and XIX., to be accompanied each by two venæ satellites, which are formed by small venous branches that return the blood circulated by the divisions of these arteries; in their ascent to inosculate with each other over the arteries,‡ and to receive numerous veins from the muscles; the anterior tibial veins running through the aperture above the interosseous

* The saphena major has been secured with a ligature for ulcers in the distal part of the extremity, but the practice is now abandoned. See page 120.

† The termination of the saphena minor in the popliteal vein is the most common; but as I had no choice of subjects, I have drawn what occurred.

‡ The union of the venæ comites superficially to the arteries in their course along the extremities should be kept in view when operating to secure these vessels.

ligament along with the anterior tibial artery, but in a reverse direction, and joining the posterior tibial veins to form the popliteal vein U, as seen in Plate XX. The fibular artery is also accompanied by two veins, which join the posterior tibial veins, as observed in the same plate.

The popliteal vein U thus formed by these different concomitant veins of the arteries of the leg, ascends on the fibular and dermal, or outer and superficial aspect of the popliteal artery T of Plate XX., receiving several venous branches from the outer heads R, R, of the gastrocnemius muscle, and several articular and other veins in its course upwards, as observed in Plate XVII., to the proximal part of the popples; accompanies the popliteal artery through the triceps to the patellar aspect of the thigh, as seen in Plates XVII. and XVI., and there assumes the name of femoral vein U,* which ascends on the three heads of the triceps and pectineus muscles, keeping first on the popliteal or posterior, and then on the tibio-popliteal or inner and posterior aspect of the femoral artery upwards to the parietes of the abdomen. In its course along the thigh, the femoral vein is joined by numerous muscular branches; by the profunda *c* veins; the saphena major *b*; the inguinal, and inguinal pudic veins, marked with the letters *f*; a vein from the integuments of the penis, marked *e*; and by another from the integuments of the abdomen, marked *d*: this venous trunk might be divided like the artery, into a superficial femoral, a deep femoral, and a common femoral vein.† The common femoral vein U, as seen in Plates XV. and XVI., runs on

* Also named crural vein.

† The popliteal vein and the superficial femoral vein, adhere closely to their respective arteries by strong cellular membrane, points of consideration for the surgeon when securing either of these arteries.

the inner or pubic aspect of the common femoral artery T, under or sacrad to Paupart's ligament B, and assumes the name of external iliac vein, seen in Plates VI., V., and I. of Part II., and described in page 28 of the same Part.

The nerves of the lower extremity have already been partly described in Part II., page 86, and are represented in Plates V. and VI. of the same Part.

In Plate XV. is observed a nervous twig, marked l, emerging at the external aperture of the inguinal canal, and accompanying the arterial branch *x* of the epigastric artery x, downwards on the spermatic cord to the tunica vaginalis b of the testis, and giving origin to nervous threads, which are distributed on the scrotum z, and the pubic portion D of the fascia lata, where they unite with twigs of the anterior crural nerve; the trunk of the nerve forming junctions with the spermatic plexus. This nervous twig l, is a branch of the first lumbar nerve that descends between the lateral abdominal muscles to the inguinal canal, and is named the external spermatic or inguinal nerve. The nervous twigs which accompany the inguinal pudic artery f, and the inguinal pudic veins *f*, derive their origin from the anterior crural nerve 22, but sometimes from the second lumbar nerve, and proceed to the scrotum and inside of the thigh, where they unite with the external spermatic, the internal spermatic, and the obturator nerves. The spermatic plexus of nerves, described in page 30 of Part II., as deriving its origin from the superior mesenteric and renal plexuses, and represented in Plate V. of the same Part, accompanying the spermatic artery, is observed, in Plate XVI., descending on the spermatic cord, in company with the branches of the spermatic artery *g*, the veins and the vas deferens l, to the testis r; supplying these objects in its course, and

uniting with the twigs of the external spermatic, and the inguinal twigs of the anterior crural nerve. The nerve marked 3 is the third lumbar nerve descending out of the abdomen beneath Paupart's ligament B, downwards to the iliac portion K, K, of the fascia lata, to the knee-joint, dividing into numerous nervous threads in this course, that supply the fascia, the cellular substance, and the skin.

22 indicates the anterior crural nerve* emerging out of the abdomen beneath Paupart's ligament B, on the iliac side of the femoral artery T, and immediately dividing into a number of nervous twigs ;† some are observed descending on the sartorius muscle E and the fascia lata K downwards to the patella Y and the knee-joint ;‡ some on the patellar and popliteal aspects of the femoral artery T, t, supplying this vessel, the inguinal glands *a*, the scrotum Z, and the saphena major *b*, § and a multiplicity of twigs supplying the different muscles in the vicinity, as observed in this and in Plate XVI., as the sartorius E, the rectus femoris I, the tensor vaginæ femoris K, the vastus externus O, the crureus P, the vastus internus L, the gracilis Q, and the pectineus F. What is termed the nervus saphenus is that twig of the anterior crural nerve that accompanies the vena saphena major *b* downwards in its course to the ankle-joint, as seen in Plate XVIII.; and which gives origin to another that descends spirally along the patellar angle or shin *a*, *a*, of the tibia, to the integu-

* Named also simply the crural nerve.

† These twigs are absurdly named the lesser superior, the greater inferior, the cutaneous medius, the cutaneous anterior, the cutaneous internus, and the nervus saphenus.

‡ The great distribution of nerves to the knee-joint should be considered by the practitioner in diseases of this articulation.

§ The nerves which cross and run along the femoral artery should be kept in view by the operator when throwing a ligature around this vessel.

ments over the ankle-joint, uniting with cutaneous twigs of the peroneus superficialis nerve. Besides this individual nerve, there are several other twigs distributed on the saphena vein in the region of the thigh.*

The obturator nerve 21 is only seen in Plate XVI. emerging between the long head g, and the short head g, of the triceps muscle, and descending downwards near the knee-joint, supplying these heads and the great head G of the same muscle, the pectineus F, the gracilis Q, and the obturator muscles, and skin in the neighbourhood. The obturator artery accompanies the nerve for a short distance.

The cauda equina 6, Plate XIV., is the continuation of the medullary globules of the four columns of the spinal marrow, forming a leash of nerves encased in neurilema, which begin after the last pair of dorsal nerves take their origin, and in the sacrum are named sacral nerves, which, like the other spinal nerves, are arranged into anterior and posterior; the former being the larger, and forming chiefly the great sacro-ischiadic nerve; the latter the smaller, and distributed on the muscles and integuments of the nates. The foramina which transmit these nerves are seen in Plates III. and VIII. of Part I., marked *n*. In Plate XVII. several of the posterior nerves, marked with the digits 2, are observed piercing the gluteus maximus F, and the gluteus medius I, near their origins, in order to supply the integuments; three of these are represented truncated.

The anterior sacral nerves have already been partly described in page 37 of Part II. The superior gluteal nerve formed within the pelvis from these, emerges at the upper part of the great sacro-ischiadic notch D, atlantal to

* The great number of nerves encircling the saphena vein show the danger of including this vessel in a ligature.

the pyriformis muscle A, and supplies the glutei muscles, the guteal artery *c*, and the integuments of the nates. The inferior gluteal nerve, similarly formed within the pelvis as the preceding nerve, issues out at the same notch below or distad to the pyriformis muscle A, accompanying the ischiadic artery *f*, and supplying the maximus F,* and the integuments of the nates. The three superior sacral, with the two inferior lumbar nerves, form the great sacro-ischiadic nerve † marked 20 in Plate VI. of Part II., that emerges from the pelvis at the greater sacro-ischiadic notch D, Plate XVII., along with the pyriformis muscle A, which frequently runs between its fasciculi, and descends between it and the gemellus superior X,‡ beneath the gluteus maximus F, and superficially to the gemelli and obturator internus muscles X, poplitead to the quadratus femoris K and the great head G of the triceps, and beneath or centrad to the long head L of the biceps muscles, where it generally divides into the posterior tibial nerve 23 and the peroneal or fibular nerve 26. This division, however, sometimes occurs immediately where the great sacro-ischiadic nerve 20 emerges from the pelvis, and sometimes not until it descends to the poples. Before its division, the great sacro-ischiadic nerve gives origin to several muscular and cutaneous twigs; the former are distributed on the gemelli and obturator internus X, the quadratus femoris K, the long head L, and short head l of the biceps, the semi-tendinosus M, the semi-membranosus N, and the great head G of the triceps; the latter, or cutaneous twigs, are marked 1 and 2; that marked 1,

* This nerve in the subject from which the drawn was taken, supplied chiefly the gluteus maximus muscle.

† Named also nervus ischiadicus and sciaticus.

‡ Both gemelli muscles and obturator internus are comprehended in the reference X, as they are intimately connected.

descending beneath or patellad to the long head L of the biceps, and poplitead or superficially to the semi-membranosus N muscles, downwards, sometimes as far distad as the knee-joint, is named the posterior cutaneous branch, and supplies the integuments in its vicinity, advancing sometimes the length of the scrotum and perineum; the other cutaneous branch, marked 2, termed the inferior posterior, descends beneath the gluteus maximus F, superficially to the long head L of the biceps, and the fibular of the outer heads R of the gastrocnemius muscles, where it encircles the saphena minor vein *z*, accompanying it downwards to the tendo-achillis *r*, and in this course supplying the muscles already mentioned, and the quadratus femoris K, the short head l of the biceps, the semi-tendinosus M, the semi-membranosus N, and the great head G of the triceps, also extensively ramified on the integuments, and uniting with the cutaneous twigs 4 of the fibular nerve.

The posterior tibial nerve 23,* the continuation of the ischiadic nerve 20, descends into the poples a little to the outer or fibular aspect of the popliteal vein U and artery T, between and beneath the two outer R, R, and the two inner heads r, r, of the gastrocnemius muscle, as seen in Plates XVII., XIX., and XX., and in the latter plate approaching the posterior tibial artery t with its venæ comites, continues to descend between the flexor pollicis A, and the flexor longus digitorum o muscles, near the abductor pollicis muscle B, where the nerve divides into the two plantar twigs 24 and 25. The external or fibular plantar nerve 24, is observed in Plate XX. to descend in company with the external plantar artery *a*, beneath the abductor pollicis muscle B, the flexor brevis digitorum C, and to appear on the fibular margin of the latter muscle,

* Also named popliteus internus.

dividing into volar twigs which subdivide into digital threads that supply the little toe and the fibular side of the fourth or ring toe; while other twigs proceed to the interossei and other muscles of these toes, the adductor pollicis, and the plantar fascia Y and integuments; the trunk of the nerve communicating with the internal plantar nerve 25., and forming an irregular arch. In its course beneath the abductor pollicis B, the external plantar nerve 24, gives origin to twigs that supply this muscle, the flexor brevis digitorum C, and the musculus accessorius ad flexorem digitorum longum. The internal or tibial plantar nerve 25, descends, accompanied by the internal plantar artery *c*, beneath the abductor pollicis B to its fibular margin, and divides into volar twigs, which subdivide into digital threads that supply the great toe, the index toe, the middle toe, and the tibial side of the fourth or ring toe; the trunk of the internal uniting with the external plantar nerve, and sending twigs to the flexor brevis digitorum C, the abductor pollicis B, the flexor brevis pollicis X, the adductor pollicis, the transversalis pedis, the lumbricales, and the interossei muscles. The distribution of these and the twigs of the external plantar nerve are also seen in Plate XIX. In the course of the trunk of the posterior tibial nerve 23 in the poples, twigs derive their origin and proceed to the popliteal artery and vein, the tendons of the inner and outer hamstring muscles, the different heads of the gastrocnemius muscle, and the popliteus muscle; also a cutaneous twig arises and accompanies the gastrocnemii arteries; in its course along the leg, twigs proceed from the nerve 23, supplying the gastrocnemius internus, the flexor pollicis longus A, the flexor longus digitorum O, the tibialis posticus a, and the posterior tibial artery t, with its venæ comites; and near the

os calcis D, a branch is observed to be distributed on this bone and the contiguous parts.

The peroneal or fibular nerve 26* is observed in Plate XVII., on the tibio-popliteal margin of the long head L of the biceps muscle, to divide into two branches, 27 and 28; the former, marked 27, consists of the nervus communicans tibiæ 4,† and the peroneus superficialis 5; the latter, marked 28, is the nervus peroneus musculos adiens profundior, or the anterior tibial nerve. The first or the nervus communicans tibiæ, or the long posterior cutaneous twig 4, is seen in Plate XIX. to descend on the fibular of the two outer heads R of the gastrocnemius muscle, giving origin to twigs which communicate with the inferior gluteal nerve 2, twigs that supply the saphena minor vein z, and to twigs which run round the leg and communicate with the peroneus superficialis 5, Plate XVIII.; the trunk running round the malleolus externus s, and appearing on the patellar aspect of the foot, as observed in Plate XVIII., distributed on the fibular margin of the foot and toes, supplying chiefly the integuments, and uniting with the twigs of the peroneus superficialis 5.

The peroneus superficialis nerve 5, the chief portion of this nervous branch 27, descends on the fibular of the two outer heads R of the gastrocnemius muscle, as seen in Plate XVII.; and in Plate XX., the nerve is observed to proceed to the head of the fibula, a little distad to which it pierces the peroneus longus muscle, and, as seen in Plate XVIII., emerges near the middle of the patellar aspect of the leg, between that muscle, marked F, and the extensor longus digitorum muscle B. The nerve then descends superficially to the muscles and fascia of the leg,

* Also named nervus popliteus externus.

† Termed also nervus cutaneous longus posterior tibiæ.

between the latter and the integuments, downwards to the toes, giving origin in this course to a number of twigs which supply the extensor muscles, as the extensor longus digitorum B, and the extensor proprius pollicis C, with the peronei muscles F; twigs that supply the integuments; twigs to the great toe, the index toe, and the tibial side of the middle toe; and twigs which unite with the nervus communicans tibiæ 4. The twigs distributed on the foot are sometimes named metatarsal.

The anterior tibial nerve, or nervus peroneus musculos adiens profundior, 28, Plate XVII., is observed to commence high in the popples, and descend superficially to the fibular of the outer heads R of the gastrocnemius muscle, near the insertion of the biceps muscle *l*; to pierce the peroneus longus muscle, and the extensor longus digitorum B, Plate XVIII., and to appear on the patellar aspect of the leg, between the latter muscle and the tibialis anticus muscle A, running superficially to the anterior tibial artery *t* with its concomitant veins, which it accompanies beneath the annular ligament D, onwards to the great toe and the index pedis; and in this course giving origin to twigs that supply the biceps, the gastrocnemii, the peronei, the extensor longus digitorum, the tibialis anticus, the extensor proprius pollicis, the extensor brevis digitorum E, and the interossei muscles, and the integuments; and uniting with the nervus communicans and the peroneus superficialis. The student must remember, that although the arrangement here adopted is one of the most common, yet as great irregularity occurs in the distribution of the nerves as of the arteries or veins.

INDEX

TO

THE LETTERS OF REFERENCE

IN

PART III.

THE BLOOD-VESSELS AND NERVES OF THE UPPER AND LOWER EXTREMITIES.

PLATE XI. *Fig.* 1.

A, Clavicle
B, Deltoid muscle
C, Greater pectoral muscle
D, Lesser pectoral muscle
E, Latissimus dorsi muscle
F, Teres major muscle
G, Long head of triceps muscle
H, Axillary artery
K, Coraco-brachialis muscle
L, Biceps muscle
O, Serratus magnus muscle

a, Thoracic arteries
c, Internal branch of subscapular artery
d, Posterior circumflex artery
e, Anterior circumflex artery
f, Profunda superior artery
g, Second head of triceps muscle
h, Brachial artery
k, Profunda inferior artery
m, Anastomoticus artery
q, Basilic vein
r, Cephalic vein
u, Brachial vein

a, Axillary glands
c, Scapular circumflex, branch of subscapular artery
g, Third head of triceps muscle
u, Axillary vein

1, Axillary plexus of nerves
2, Median nerve
3, External cutaneous nerve
4, Internal cutaneous nerve
5, Ulnar nerve
6, Spiral nerve
7, Thoracic nerves
9, Intercosto-humeral nerves, and cutaneous nerve of Wrisberg
14, Branches of internal mammary artery

PLATE XI. *Fig.* 2.

I, Pronator radii teres muscle
N, Supinator radii longus muscle
P, Flexor carpi radialis muscle
Q, Palmaris longus muscle
R, Flexor digitorum sublimis muscle
S, Flexor carpi ulnaris muscle
T, Pisiform bone
V, Palmar aponeurosis
Y, Abductor pollicis muscle
Z, Flexor brevis pollicis muscle

h, Brachial artery
l, Tendinous expansion of biceps muscle
o, Radial artery
q, Basilic vein
r, Cephalic vein
s, Median vein
t, Median basilic vein
v, Median cephalic vein

h, Ulnar artery
x, Thenal branch of the radial artery

2, Median nerve
3, External cutaneous nerve
4, Internal cutaneous nerve
5, Ulnar nerve
16, Cutaneous twig of the spiral nerve
36, Thenal twig of the spiral nerve
46, Anconal twig of the spiral nerve

PLATE XII. *Fig.* 1.

A, The clavicle
B, Deltoid muscle
D, Acromion scapulæ
E, Latissimus dorsi muscle
F, Teres major muscle
G, Long head of triceps muscle
H, Axillary artery
L, Biceps muscle
M, Brachieus internus muscle
N, Supinator radii longus muscle

d, Posterior circumflex artery
f, Profunda superior artery
g, Second head of triceps muscle
i, Radial recurrent artery
a, Proper posterior ligament of scapula
c, Scapular circumflex branch of subscapular artery
u, Brachial vein

1, Axillary plexus
6, Spiral nerve
8, Supra-scapular nerve
51, Supra-scapular artery
66, Supra-spinatus muscle
80, Teres minor muscle
81, Infra-spinatus muscle

PLATE XII. *Fig.* 2.

I, Pronator radii teres muscle
N, Supinator radii longus muscle
P, Flexor carpi radialis muscle
Q, Palmaris longus muscle
R, Flexor digitorum sublimis muscle
S, Flexor carpi ulnaris muscle
T, Pisiform bone
U, Annular ligament
W, Flexor digitorum profundus muscle
X, Flexor longus pollicis muscle
Z, Flexor brevis pollicis muscle

h, Brachial artery
i, Radial recurrent artery
n, Ulnar recurrent artery
o, Radial artery
p, Interosseous artery
h, Ulnar artery, and superficial palmar arch
o, Deep palmar arch of radial artery
w, Adductor pollicis muscle

2, Median nerve
5, Ulnar nerve
6, Spiral nerve
12, Interosseal nerve
15, Dorsal, or anconal twig of ulnar nerve
16, Cutaneous twig of spiral nerve
26, Deep branch of spiral nerve
50, Pronator quadratus muscle
51, Abductor minimi digiti muscle
52, near z, Flexor ossis metacarpi pollicis muscle
52, near 51, Flexor parvus minimi digiti muscle

PLATE XIII.

B, Extensor carpi ulnaris muscle
D, Extensor digitorum communis muscle
U, Posterior portion of annular ligament

o, Radial artery
q, Basilic vein
r, Cephalic vein

a, Extensor ossis metacarpi pollicis muscle
b, Extensor primi internodii pollicis muscle
c, Extensor secundi internodii pollicis muscle
d, Arteria magna pollicis

15, Anconal twig of ulnar nerve
36, Thenal twig of spiral nerve
46, Anconal twig of spiral nerve

PLATE XIV.

A, Symphysis pubis
B, Sacrum
C, Coccyx
G, Tuberosity of ischium
I, Rectum and anus
X, Corpus cavernosum penis
Y, Gluteus maximus muscle
Z, Scrotum

m, Urinary bladder
o, Acceleratores urinæ muscles
p, Erector penis muscle
q, Transversus perinei muscle
r, Sphincter ani muscle
s, Levator ani muscle
t, Prostate gland
u, Vesiculæ seminales
v, Vas deferens
w, Ureter

b, Internal hemorrhoidal artery
g, Spermatic artery
h, Internal pudic artery
n, Catheter

1, Artery of corpus spongiosum penis
2, Artery of corpus cavernosum penis
3, Arteria dorsalis penis
4, Twig of sacral nerves
6, Cauda equina

PLATE XV.

A, Symphysis pubis
B, Paupart's ligament
C, Anterior superior spinous process of os ilium
D, Pubic portion of fascia lata
E, Sartorius muscle
K, Iliac portion of fascia lata
T, Femoral artery
U, Femoral vein
Y, Patella
Z, Scrotum

a, Cremaster muscle
b, Tunica vaginalis testis
f, Inguinal pudic artery
t, Superficial femoral artery
x, Epigastric artery

a, Inguinal glands
b, Saphena major vein
c, Circumflex iliac artery
d, Vein of integuments of abdomen
e, Vein of integuments of penis
f, Inguinal pudic veins
x, Spermatic branch of epigastric artery

1, Spermatic twig of first lumbar nerve
3, Third lumbar nerve
22, Anterior crural nerve
70, Suspensory ligament of penis

PLATE XVI.

A, Symphysis pubis
B, Paupart's ligament
C, Anterior superior spinous process of os ilium
E, Sartorius muscle
F, Pectinalis muscle
G, Adductor magnus muscle
I, Rectus femoris muscle
K, Tensor vaginæ femoris muscle
L, Vastus internus muscle
N, Semi-membranosus muscle
O, Vastus externus muscle
P, Crureus muscle
Q, Gracilis muscle
T, Common femoral artery
U, Femoral vein
W, Psoas magnus and iliacus internus muscles
Y, Patella

c, Arteria profunda
d, Internal circumflex artery
e, External circumflex artery
g, Adductor longus muscle
r, Testis
t, Superficial femoral artery
x, Epigastric artery

a, Anastomoticus artery
b, Saphena vein
c, Circumflex iliac artery truncated
c, Profunda veins
g, Spermatic artery running down to testis *r*
g, Adductor brevis muscle, beneath adductor longus g
r, Epidydymis

1, Vas deferens
3, Arteria dorsalis penis
21, Obturator nerve
22, Anterior crural nerve
60, Vena magna penis

PLATE XVII.

A, Pyriformis muscle
B, Sacrum
C, Coccyx
D, Great sacro-ischiadic notch
E, Sartorius muscle
F, Gluteus maximus muscle
G, Adductor magnus muscle
H, Long sacro-ischiadic ligament
I, Gluteus medius muscle
K, Quadratus femoris muscle
L, Long head of biceps muscle
M, Semi-tendinosus muscle
N, Semi-membranosus muscle
Q, Gracilis muscle
R, Gastrocnemius externus muscle
T, Popliteal artery
U, Popliteal vein
X, Obturator internus, with gemelli muscles
Z, Tuberosity of os ischium

b, Posterior superior spinous process of os ilium
l, Short head of biceps muscle

PLATE XVII. *Continued.*

a, a, Arteriæ gastrocnemiæ
b, Saphena major vein
c, Gluteal artery emerging from great sacro-ischiadic notch
c, Continuation of profunda femoris artery emerging at the ham
f, Ischiadic artery
h, Internal pudic artery
l, Insertion of biceps muscle
z, Saphena minor vein

1, Posterior cutaneous twig of great sacro-ischiadic nerve
2, Inferior posterior cutaneous twig of great sacro-ischiadic nerve
2, Posterior sacral nerves truncated
4, Nervus communicans tibiæ
5, Peroneus superficialis nerve
20, Great sacro-ischiadic nerve
23, Posterior tibial nerve
26, Fibular nerve
27, Trunk of nervus communicans tibiæ, and peroneus superficialis
28, Anterior tibial nerve

PLATE XVIII.

A, Tibialis anticus muscle
B, Extensor longus digitorum pedis muscle
C, Extensor pollicis pedis muscle
D, Annular ligament
E, Extensor brevis digitorum pedis muscle
F, Peroneus longus muscle
G, Malleolus externus

c, Malleolar arteries
e, Tarsal branches of anterior tibial artery

a, Spine of tibia
b, Saphena major vein
d, Recurrent branch of anterior tibial artery
f, Digital branch to great toe and index pedis
s, Malleolus internus
t, Anterior tibial artery
z, Saphena minor vein

4, Nervus communicans tibiæ
5, Peroneus superficialis nerve
28, Anterior tibial nerve

PLATE XIX.

A, Flexor pollicis longus muscle
D, Os calcis
O, Flexor digitorum longus muscle
R, Gastrocnemius externus muscle
S, Malleolus externus
Y, Plantar fascia

a, Tibialis posticus muscle
r, Gastrocnemius internus, or soleus muscle
t, Posterior tibial artery

a, External plantar artery emerging from plantar fascia Y

a, Arteriæ gastrocnemiæ ramified on gastrocnemius muscle R
b, Saphena major vein
q, Inner angle of tibia
r, Tendo-achillis
s, Malleolus internus
z, Saphena minor vein

2, Posterior inferior cutaneous twig of great sacro-ischiadic nerve
4, Nervus communicans tibiæ
23, Posterior tibial nerve
24, External plantar nerve
25, Internal plantar nerve

PLATE XX.

A, Flexor longus pollicis muscle
B, Abductor pollicis muscle
C, Flexor brevis digitorum muscle
D, Os calcis
E, Sartorius muscle
F, Abductor minimi digiti pedis muscle
L, Vastus internus muscle
M, Semi-tendinosus muscle
N, Semi-membranous muscle
O, Flexor longus digitorum muscle
Q, Gracilis muscle
R, Gastrocnemius externus muscle
T, Popliteal artery
U, Popliteal vein
V, Popliteus muscle
X, Flexor brevis pollicis muscle

a, Tibialis posticus muscle
r, Gastrocnemius internus, or soleus muscle
t, Posterior tibial artery
y, Fibular artery

a, External plantar artery
b, Saphena major vein
c, Internal plantar artery
r, Tendo-achillis
s, Malleolus internus
t, Anterior tibial artery

5, Peroneus superficialis nerve
23, Posterior tibial nerve
24, External plantar nerve
25, Internal plantar nerve
28, Anterior tibial nerve

EDINBURGH :
Printed by John Brewster,
11, Society.

PHYSIOLOGICAL

AND

PATHOLOGICAL OBSERVATIONS.

THE pabulum of life, taken up by the absorbents, is conducted by the thoracic duct to the venous system, which it joins at the angle formed by the internal jugular and the subclavian veins of the left side. This subclavian vein, having the nutritious lymph blended with the blood returned from the left side of the head and the upper extremity, soon unites with the subclavian vein of the right side, returning the blood of the arm and head of the same side, and forms the vena cava descendens, which is immediately joined by the vena azygos. The vena cava descendens, by its undulatory motion, propels the blood onwards to the right or pulmonic auricle,* where meeting with that returned by the vena cava ascendens, which is the trunk of the venous system of the lower extremities and the abdomen, and that returned by the coronary vein of the heart, the fleshy parietes of this auricle are distended, stimulated to action, and contracting, propel the blood

* Syn. Right sinus venosus.

through the tricuspid valve into the right or pulmonic ventricle; the blood being prevented flowing downwards into the inferior vena cava by the valve of Eustachius, and the accumulation of blood advancing to pursue the same course; and from flowing upwards by the current of blood, and the vis a tergo. When the right ventricle is distended, its fleshy parietes are excited, which contracting propel the blood out of the cavity, at the mouth of the pulmonary artery; the blood being prevented regurgitating into the right auricle by the tricuspid valve stretching across the aperture, from the blood stimulating its columnæ carneæ to contraction: and in order that the ventricle may be thoroughly distended, the semilunar valves at the mouth of the pulmonary artery offer, in the commencement of the distension of the cavity, a resistance to the blood, in consequence of their being filled with this fluid when the pulmonary artery contracted to propel the blood which immediately preceded. Part of the tricuspid valve also assists in forming this obstacle to the flow of blood at the pulmonary artery, by its partly overlapping the opening into the artery. The blood then enters the pulmonary artery, which being stimulated, contracts, and propels the fluid through its branches in the lungs, where giving off carbonaceous matter, and assuming a vermilion hue, it returns by the four pulmonary veins into the left or systemic auricle* of the heart; which being similarly excited, contracts, and propels the blood through the mitral valve into the left or systemic ventricle; which also similarly contracting, propels the blood into the aorta, the branches of which maintaining the like contractile motion, propel the blood over all the system, its gelatinous and fibrous part being retained

* Syn. Left sinus venosus.

in the cells of that vascular parenchyma, that forms the basis of the whole fabric. While one portion flows to the brain to stimulate the source of the nervous system, other portions are entangled in the peculiarly-formed labyrinths of the glands, in the excretory ducts, and the exhaling vessels, forming the various secretions and excretions. The remainder of the blood, impregnated with carbon, and of a dark red colour verging to purple, returns by the veins to undergo the same course. The blood in the pulmonary artery is prevented returning into the right ventricle by the distention of the three semilunar valves at its mouth, and from the aorta into the left ventricle by the same wise arrangement. The mitral valve opposes a similar barrier to the blood regurgitating into the left auricle, that the tricuspid valve does between the right ventricle and its corresponding auricle. The mitral, like the tricuspid valve, also assists in preventing the blood, on its entrance into the ventricle, flowing out at the aorta. The mechanism of the tricuspid and mitral valves is such, that when the blood presses on them from behind, they all meet in the centre of the aperture, so as to effectually shut up the passage; and the flaps of the mitral valve even overlap each other. When the auricles act, the columnæ carneæ, and chordæ tendineæ, prevent the membranous valves falling into the auricles; and when the ventricles act, those fleshy columns contract and moderate the distance which the flaps might otherwise have, and prevent them also falling into the auricles.

On opening the thorax of a living animal, the blood is observed to flow from the veins into both the auricles at the same moment of time, so as to distend them; and they are no sooner filled than they contract, and propel the blood into the ventricles, which being also distended, contract by the apex approximating the centre of the

cavity, and inject the blood into the arteries. Thus both the auricles and ventricles are filled and emptied, the auricles distending while the ventricles are contracting, and vice versâ; and the auricles being no sooner emptied, than they are filled again from the veins. When the venæ cavæ and pulmonary veins are emptying themselves, the ventricles are also contracting; and while the auricles are propelling their blood into the ventricles, the pulmonary artery and aorta are at the same time contracting. The cavity which first ceases to contract at death is the left ventricle; secondly, the left auricle; thirdly, the right ventricle; and lastly, the right auricle, which last continues longest to vibrate: hence, when the heart is laid open, very little blood is found in the left side, while it is accumulated on the right side.* When the auricles contract, the veins become swollen, which appearance extends even to their ramifications, from the regurgitation or impediment to the flow of the blood which has been thus accumulating in its course onwards to enter the auricles. Thus we observe there are no effective valves at the entrance of the venæ cavæ, in order to allow the blood to regurgitate out of the heart when any impediment occurs. The auricles, from their structure, seem capable of expelling all their contents.

When the cavities of the heart are opened in a living animal, the septum ventriculorum and columnæ carneæ are observed shortening themselves, so as to propel their contents into the arteries; and during relaxation of the different cavities, the sides are in contact, or collapsed, and the heart expands or passes into the diastole, and remains in that state till the blood stimulates it to contract; and after death, the muscular parietes and columns

* This order should be considered in medical jurisprudence.

possess little or no elasticity, so that the heart appears to have no power of distending itself; but the auricles become swollen by the blood poured into them by the veins, and the ventricles are distended by the blood propelled into them by the auricles, one and all of them contracting by the blood stimulating their muscular parietes through the medium of the nerves, the same as takes place in the alimentary canal from the stimulus of the food, or, as is evidenced in the lacteal vessels, from the stimulus of the lymph. The naturally collapsed state of the cavities, and their distension solely by the blood, will cause them to contract with more energy, and enable them to expel more completely all the blood; and hence the greater the quantity of the blood circulating in the viscus in a given time, the more forcible are its contractions, as is exemplified in running, or any other active exercise.*

At birth, the heart contracts from 130 to 140 in the minute; at one year old, 120; at two years old, 110; at three years, 90; at seven years, 85; at fifteen years, or puberty, 80; at mature age, from 65 to 75; and in old age, between 60 and 70;—all, however, varying considerably in different individuals.† The cause of a single sensation of a palpitation of the heart, is the contraction of the ventricles, arising from a change of the situation of the apex of the heart striking against the cartilages of the ribs; and at the same moment that the ventricles are contracting, the left auricle is filling, which cavity being

* These different motions of the heart have been witnessed in cold and warm-blooded animals by a number of experimenters, by Steno, Bartholinus, Peyer, Lewenhoeck, Willis, Caldesi, Harvey, Pecquet, Lancisius, Muraltus, Maitre Jean, Senac, Haller, and Spallanzani.

† These differences of the pulse should be carefully considered by the practitioner, that he may be able to calculate the aberration in disease.

placed posteriorly, or dorsad, will strike the vertebræ, so as to assist in producing this sensation. The exterior fibres are seen to curl themselves, the apex is attracted to the base, the heart becomes shorter and blunter, and is bent forwards and to the right, or sternad and dextrad. The curve in the apex of the heart is ascribed to the straightening of the aorta while it is filling. As each ventricle can hold between two and three ounces of blood after death, it is consistently supposed, that this quantity is ejected into the arteries at each time in life; and according to the most unexceptionable calculations, the quantity of blood in the body is estimated at thirty pounds, each pound being twelve ounces. About two ounces of blood, therefore, leave the heart at each contraction; and as there are seventy contractions occurring in the minute, the whole mass of blood circulates about twenty-three times in an hour, or once in two minutes and a half.*

The powers of the muscular structure of the heart have been estimated by Borelli, Hales, and Haller, but seemingly in a very defective manner. From the circumstances required to be taken into calculation, it appears to be extremely difficult; these are the area of the heart, the area of the aorta, the quantity of blood propelled, the velocity of the blood, the resistance, &c. all of which can scarcely be ascertained, and even if ascertained in one, there is so much variety in different individuals, that it is probable it would be of little advantage.

To direct the heart in its motions, to afford it liberty, and to prevent friction, the heart is provided with a capsule, named pericardium, the dimensions of which are a little larger than its greatest expansions, and from the sur-

* This rapidity of the circulation enables us to explain the quick discharge of fluids by the urine, when diuretics are given.

face of both of which a serous fluid is poured out. That the pericardium directs or limits the motions of the heart we are entitled to conclude, from its being found stronger in those animals that have no diaphragm, and also from its adhesion to the diaphragm being only found in man, and some of the simiæ who walk erect. The pericardium is firmly fixed to the diaphragm, which in expiration brings the upper part of it to the level of the fourth rib. The serous fluid, besides the uses already ascribed to it, also prevents adhesion of the heart to the pericardium: this fluid was observed by Spallanzani in living salamanders, so that it does not appear to be the condensation of a halitus after death. When coloured water is injected into the coronary arteries, it transudes by a multiplicity of pores from the surface of the heart, the large blood-vessels, and the pericardium. This fluid of the pericardium is generally about a drachm or tea-spoonful in quantity, and is often of a yellowish colour, from bile. The analysis is, water 92, albumen 5, mucus 2, muriate of soda $\frac{5}{100}$.*

The heart is present in all animals, with the exception of insects and zoophytes. It varies a little in its shape in quadrupeds, birds, and several fishes; in some of the latter it is short and thick, in other fishes it is cylindrical, in others semicircular, while in others again it is long and slender, and in others quadrilateral. In the mollusca, it is sometimes lobed, and sometimes semicircular. In man, we find it conical, and fixed by its large vessels at the right side and base, while its middle, left side, and apex are left free, the latter having an oblique direction to the left side, its flat surface resting on the

* Littre details the case of a woman who lived to 54 years of age without the pericardium. The heart was dry, rugged, and hard, and had little adipose substance. She is stated never to have enjoyed good health.

diaphragm, with the intimate connection of the pericardium to the latter. No animal which has veins is found destitute of auricles or sinus venosi, but they are absent in those animals whose hearts are long, and which viscus also constitutes the principal artery, and in whom the veins cannot be distinguished from the arteries.

Amphibious animals have the largest auricles, which may assist them in remaining long under water. There are two auricles in those warm-blooded animals that have two ventricles and four great vessels, and that propel the whole blood of the right ventricle through the lungs before it arrives at the left ventricle, as in mammalia and birds. One auricle is found where there is one ventricle, and where only a small portion of the blood runs through the lungs, as in cold-blooded animals, or in those whose blood is a trifle warmer than the circumambient water. One auricle is also only found in oviparous quadrupeds.

The mollusca differ materially in the parts of the heart; all of them have a left or systemic ventricle; many have a dilatation of the venæ cavæ compared to an auricle, and two lateral hearts or ventricles: the heart is sometimes lobed, and sometimes semicircular. The seiches have two hearts separated, and the pulmonary is divided into two. The lingules have the systemic heart divided into two. The pectinibranches have two auricles. The acephalous mollusca have either two lateral hearts or ventricles, or one ventricle with one or two auricles; or only a simple systemic ventricle, as the acephalous tuncata. The larger crustacea have two ventricles. Fishes have only one auricle, and one ventricle, the latter of which is placed at the commencement of the pulmonary artery. Reptiles have either two auricles and one ventricle, or one auricle and one ventricle.

In the fetus, the heart is larger in proportion than in

the adult. It is larger in quadrupeds and birds of a small, than in those of large size. In birds, the heart is found larger than in quadrupeds; and the same relative proportion is stated by Haller to be found in ferocious animals, compared with tame animals; but Hales contradicts this, for he found timorous animals, as deer, asses, and hares, to have larger hearts than courageous ones. Male animals are stated to have larger hearts than females. The heart is smallest in fishes, and smaller in cold-blooded than in warm-blooded fishes. Valisnerus observes, that the columnæ carneæ are most numerous in swift running animals, as the stag or hare.

The heart being supplied with nerves, and being a muscular viscus, possesses the powers of contractility, or those of sensibility and motion, in a marked degree. The heart is sensible to numerous stimuli after death, and the more so the earlier it is experimented on; a drop of saliva, or any acid, or a particle of common salt, excites its contractions; so also does the stroke of a probe, the prick of a needle, the separation of the sides of the thorax, or the blowing of air into the large veins contiguous to the heart. Electricity and galvanism are powerful agents in restoring the motions of the heart after death; as also the inflation of the lungs, and stimuli to the brain.* Experiments on the heart are best elucidated on those animals which have the nervous system much diffused, as in the cold-blooded.

When air, water, or vinegar is injected into the veins leading to the heart, its action is increased, and the more so according to the stimulus; from which we can account

* In asphyxia these agents, as electricity, galvanism, the resuscitating bellows, stimuli to the head, as hot sinapisms, or pungent salts to the nostrils, should be employed. Stimuli into the stomach also excite the heart's motions.

for salt or pungent provisions, or stimulating liquors, exciting an undue action in the heart, independent of their first operation on the nerves of the alimentary canal. Hales observes, that the force of the blood is very different, not only in animals of different species, but also in animals of the same kind, and even in the same animal, where it is continually varying according to the different kinds and quantities of food, the various distances of time after taking food, the more or less plethoric state of the system; also from exercise, rest, different states of vigour or vivacity of mind in the animal, likewise from climate, heat, cold, and evacuations, so as probably never to be exactly the same any two minutes during the whole life of the animal. Dr. Bostock analysed the serum of the blood of a young lady, who had been taking for some time the subcarbonate of soda, to the extent of three ounces daily, and found it much more strongly alkaline than ordinarily.

The exposure of the heart to a moderate degree of cold, or to caloric, increases the number of its contractions; while an intense degree of cold suppresses them by impeding its motions, and a great degree of caloric arrests them by exhausting its motions. Alcohol and opium seem to have a similar mode of operation to caloric; they at first increase, but soon diminish the heart's motions by exhaustion. Opium has a more transient stimulation than alcohol.

Irritation, injury, or even destruction of various parts of the nervous system, generally increase the contractions of the heart for a time, which, however, are frequently very feeble; but compression of the nervous system impedes or suppresses these actions. These are exemplified in phrenitis caused by irritation of blood, and in compression of the brain from matter, water, blood, or depressed

bone.* Almost every emotion of the mind influences the actions of the heart; thus this viscus acts more frequently in joy, more quickly and strongly in anger, more slowly and languidly in grief. The happy influence of joy, or mental exhilaration on the heart and general system, is admirably illustrated in the history of the siege of Breda, and in Colonel Stewart's interesting Sketches of the Highland Regiments in the West Indies. These, and other similar facts, prove that the heart is indirectly voluntary. Hales, by his experiments, proves that sighing increases the actions of the heart and arteries, consequently study or anxiety is injurious in pectoral complaints.

The external objects of nature operating on the organs of sense, influence the actions of the heart; thus different scenes in nature produce different effects, placid scenery tranquillizes them, wild picturesque scenery quickens them, and a parterre of roses accelerates them.

Certain sensations are also found to affect the actions of the heart, as various smells. The smell of the white lily has been known to produce immediate fainting, so also that of boiled beans, or that from the snuff of a candle. Pain likewise operates in a similar manner, as a blow on the knee or testis, or a surgical operation. The application of tobacco leaves over the region of the stomach diminishes the actions of the heart, so also does this narcotic when administered per rectum. Any substance disturbing the functions of the alimentary canal influences the actions of the heart; thus the gas evolved in the stomach in dyspepsia, by exciting the expanse of the par vagum, instantaneously produces palpitation and

* The experiments of Dr. Wilson Philip, and M. Le Gallois, throw much light on the effects of causes operating on the brain and spinal marrow, and ultimately on the heart; they, in my opinion, satisfactorily establish the most direct chain of connexion between these organs.

irregular action of the heart. Narcotics passing along the pharynx and œsophagus into the stomach, operate on the nervous expanse of these organs, and thus influence both directly and indirectly the motions of the heart; directly, through the medium of the par vagum to the heart, and indirectly, through the medium of the brain. The swallowing of ether and laudanum in combinationis an excellent illustration. An infusion of tobacco, or the Prussic acid, when swallowed, instantaneously overpowers the nervous system, and then the actions of the heart. The metallic poisons irritate, and then destroy, the nerves of the stomach, and hence influence the actions of the heart. Diseases of the bowels produce, through the medium of the nerves, a quickened action of the heart.

Substances, through the medium of the lungs, affect the motions of the heart; thus, the breathing of the fumes of alcohol, or nitrous oxide, increases them, while those of hydro-carbon, or pure carbonic acid gas, diminish them.* The actions of the heart can also be influenced through the medium of the skin; thus cold or heat applied to the surface, either accelerates or lessens them, according to the time of duration.† All these effects are produced by these various agents operating through the medium of the nerves.

Besides the quality of the blood stimulating the heart, the quantity circulating in the viscus increases its contractions, and the greater the quantity of blood entering the heart in a given time, the more is the action increased, in consequence of the parietes having a natural tendency to collapse. This is satisfactorily proved in running, or

* The breathing of hydro-carbon is an excellent remedy in mania, to suspend the diseased intellectual functions for a time.

† It is from these effects that cold, warm, and vapour baths prove so valuable remedies in disease; the vapour in cutaneous diseases, the warm in fevers, and the cold for convalescents.

any other active exercise. Such violent voluntary muscular actions at first increase the number and strength of the contractions of the heart, but when long continued, the number increases, although not the strength, the functions of the heart becoming exhausted, in consequence of the structure being unable to keep up for any length of time this forced action.

The muscular fibres of the heart themselves are sometimes acted on by the venous blood getting access to the coronary arteries, as in asphyxia, which diminishes the sensibility of the heart.

Blood-letting always diminishes the sensibility of the heart, by first removing a portion of the stimulus to the brain; and, secondly, by lessening the quantity of the stimulus to the heart itself. But this does not always occur in proportion to the quantity abstracted, for some faint from the abstraction of a very small quantity, while others are able to bear a large quantity removed; which effect seems to depend on the firmness of the fabric of the individual. Hence fat flabby people faint sooner than lean firm individuals. In the lean constitution, pressure seems to be kept up between the different structures of the system; while in the loose flabby frame, pressure or support is deficient, and thus it resembles the dropsical habit. Bleeding an individual, while in the erect posture, produces fainting sooner than when in the horizontal, and apparently on the same principles. When erect, the blood cannot be propelled so easily or so quickly to the brain; this organ, therefore, deprived of its wonted pressure or support, and also of its stimulus, is unable to perform its functions, and fainting, consequently, is the result. But the stimulus of the blood to the brain does not account for this effect so well as pressure or support. The depriving of the organ, therefore, of its support,

must be the first effect, which is corroborated by what occurs in paracentesis abdominis for dropsy of that cavity, by what takes place in leaping suddenly out of bed in the morning, or in raising a patient too quickly after fever, or any disease which has confined him long in the horizontal posture. The heart contracts or palpitates more quickly by twelve beats, in the erect than in the horizontal posture; but this varies in different constitutions, particularly in the native of a cold climate, who has resided long in a tropical one. In feeble people it is greater, and in all habits it is greater after eating or drinking, or exercise.

The inflammatory action greatly influences the motions of the heart; hence in inflammation of any degree, the heart always accompanies and constitutes part of the inflammatory fever. Sometimes the quickened action of the heart precedes the appearance of the inflammation, while at other times it follows: in the former, the increased circulation, from whatever cause, so excites the nerves and arteries, that they are unable to return to their wonted quiescence; in the latter, or when the quickened action of the heart follows the inflammation, the heart is excited by the diseased action of the nerves of the part being transmitted along the nerves to the heart.

The quantity of blood circulated by the heart may be increased, or diminished, or be the same as in health, while the motions of this viscus are disturbed. When the quantity is the same as in health, the pulse if more frequent will be feebler, and if slower, will be stronger; in the former, the heart will either never be filled, probably in consequence of increased sensibility, or never be emptied, in consequence of the debility of its muscular powers. The effect of this indicates a derangement in the nervous and muscular systems. If the quantity of blood circulated

by the heart be diminished, the arteries will be contracted, until they become only capable of propelling the blood through the capillary vessels, with a proportionally smaller velocity. The veins will become distended, unless the muscular coat of the arteries can be sufficiently relaxed to afford a diminished tension, which is probably the case. In this state, the pulse is small and weak, and the arteries being partly exhausted, there will be a paleness and chilliness of the extremities, which is also partly produced by a derangement of the nervous system; until the blood that is accumulated in the veins has sufficient power to urge the heart to a greater action. A contrary state now arises, the quantity of blood circulated by the heart is increased, and the pulse is full and strong, the arteries continue to propel the blood easily into the veins, until a relaxation of their capillaries takes place, probably to such an extent, that another general derangement of the circulation is produced. The motion of the blood being accelerated, and the arteries emptied, so that the pulse may be small and weak, while the veins are overcharged, and the heart exhausted by violent and fruitless efforts to restore the equilibrium. When, on the contrary, the capillary vessels are contracted, the arteries are again distended.

From what has been stated in the preceding observations, it will be at once understood, how easily and readily the functions of the heart are deranged, that no disturbance of either the respiratory, the circulating, the alimentary, or the mental functions, or injury to any other function or organ, can take place, without influencing or involving more or less the actions of this important organ. The envelope of the heart is subject to inflammation, and some of its terminations, as adhesion and dropsy, also to a peculiar hardened state, and to ossification.

The heart itself is subject to the following diseases:—to inflammation, and some of its terminations, as suppuration, ulceration, and gangrene; to a peculiar softened state, to hypertrophia, to atrophia, to aneurism, to rupture of its parietes, to the foramen ovale remaining open, to an aperture in the septum ventriculorum forming a communication between the ventricles, to a conversion into cartilage, and to ossification.

Pericarditis and carditis are the terms given to inflammation of the pericardium and the heart, the former being a much more prevalent disease than the latter, and generally occurring in the rheumatic constitution, being frequently combined with pleuritis or pneumonia, and being with difficulty distinguished from the latter. The morbid appearances seen in pericarditis, are, a layer of coagulable lymph on the interior surface of the pericardium, and also on the surface of the heart, occasionally so abundant, as to fill up the space between them, forming a delicate bond of adhesion. The exterior or pleuritic surface also sometimes displays marks of inflammation, in which case the affection is complicated with disease of the pleura. Instead of so great a quantity of lymph being deposited, there is at other times a more or less quantity of serum effused, which is occasionally tinged with blood. The symptoms of this disease are, acute pain in the region of the heart, aggravated on motion or on inspiration; violent palpitation of the heart, but small regular pulse, rendered irregular on motion; irregular, anxious respiration, slight cough, and a tendency to syncope on moving. There is also an anxious expression of countenance. The treatment consists in large and repeated bleedings, the application of blisters in the cardiac region, large doses of Hyosciamus and digitalis, brisk cathartics, enemata, rest, and low diet. There are two

varieties of this as of most other important diseases, namely, the acute, and the chronic, the latter of which is very ill defined in its symptoms.

When pericarditis does not prove fatal, it ends either in an abatement or resolution of the disease, in adhesion of the pericardium to the heart, or in effusion of serum constituting dropsy: when adhesion is the result, the morbid appearance is a greater or less extent of union, through the medium of coagulable lymph, between the pericardium and the heart, which is sometimes so extensive and connected, as to cause many believe that no pericardium existed, this membrane requiring to be patiently dissected off from the heart. The symptoms characteristic of this disease in life, are, a painful sensation of pulling or tugging in the region of the heart, respiration rendered laborious and frequent on the slightest motion, sudden flushings of the countenance, irregular pulse, particularly on moving, and syncope often occurring. There is no palpitation of the heart.

In dropsy of the pericardium or hydro-pericardium, the serous effusion varies from seven ounces to eight pounds, and when it accumulates to this quantity, such pressure is made on the heart, large blood-vessels, and lungs, as to prove fatal. The colour of the fluid is more or less green, and quite transparent. The pericardium is always thickened, and has been found hardened like a dried bladder. The symptoms of this affection are, an oppressive weight in the region of the heart, occasionally attended with palpitations; difficulty of breathing threatening suffocation in the horizontal posture, a painful anxiety, and frequent syncope; obscure and tumultuous pulsations felt over the region of the heart, and in different parts of the thorax, according to the quantity effused; when the patient

stoops forward and inclines rather to the left side, an obscure pulsation felt low down or sacrad in the thoracic cavity, and a more forcible beat in the region of the heart; the pulse small, feeble, frequent, and sometimes irregular; and the face of a bloated violet colour, with blackish livid lips. The treatment consists in giving diuretics and cathartics, as in other dropsical affections, and if the constitution is capable of bearing it, the catharsis ought to be carried as far as possible, as the cure of dropsy is to be accomplished more by this excitement, which rouses the absorbents to greater action, than by diuresis. Riolanus recommends puncturing the pericardium in this dropsical affection, in which he is supported by Senac, and by Dessault, who performed what he conceived to be this operation; but after death, the effusion was found collected in a sac formed by the left lungs and the pericardium. If cautiously undertaken, I see no danger to be apprehended from the operation, and shall certainly perform it the first opportunity. An incision should be made between the fifth and sixth ribs through the integuments, but in such a way that the skin may afterwards act as a valve; it should therefore be pulled upwards or atlantad. The greater pectoral and intercostal muscles should then be cautiously divided, the operator keeping sufficiently distant from or lateral to the sternum, so as that he may avoid the internal mammary artery, (*see Plate* 3, *in Part* 2, *Fig.* 3, *digit* 14.) The pleura costalis will most probably be divided along with these muscles, as the pericardium will generally be found adhering to it; the latter seen distended and agitated with the fluid, should now be carefully opened, making a small aperture, with the scalpel, bistoury, or lancet, when the fluid will exude. If the pericardium does not adhere to the pleura costalis,

the incision in the pleura must be enlarged so as to admit the finger, which, when introduced, will feel the distended pericardium, that can then be punctured with a sharp pointed bistoury guided along the finger.

After the operation, it will be requisite to continue the diuretics, and it may also be necessary to repeat the paracentesis as in ascites.

The pericardium has been found distended and hardened like a dried bullock's bladder, and also ossified in one part to a considerable extent.

Carditis, we have already observed, is with difficulty distinguished from pericarditis in the living, but with ease in the dead state: in the latter, the appearances are, an inflamed state of the pericardium, with more or less of a yellowish purulent matter; a deposition of lymph on the surface of the heart, the muscular structure of which is pale, flabby, and soft, being easily torn and separated into layers, in consequence of depositions of purulent matter in the cellular tissue; the blood-vessels enlarged, increased in their branches, and covered with pus; and the cavities filled with coagulable lymph, which extends even into the great vessels. The symptoms of this disease are merely an aggravation of those of pericarditis; and the treatment must consequently be the same, with a similar modification to answer the greater evil. The best marked cases of carditis which I have witnessed, have followed inflammation of a vein from bloodletting, and the throwing a ligature round a wounded vein, as, for instance, the axillary.

Carditis generally terminates in suppuration, the morbid appearances of which have been described. There are also instances where the pus has been confined to an abscess in the fleshy parietes of one of the cavities, and also in the cavities themselves. This state, we may pre-

sume to say, must always prove immediately fatal, so that if the treatment of the inflammatory stage prove ineffectual, there will be no symptoms of the suppurative stage except rigors, and no treatment required. Chronic inflammation of the heart sometimes ends in ulceration, which has been known to go on until the parietes have been eaten through, and then proves fatal by effusion of the blood.* If inflammation of the heart, before it ends in suppuration, proves fatal, this eventful result must occur before gangrene can take place. Storck, however, and Leroux, in Corvisart, detail cases of this termination having been visible, while Corvisart seems to doubt it.

In acute fever the heart is more or less affected, sometimes to the extent of being rendered softer and of a deep red colour, the latter, however, occasionally approaching to brown, and the muscular structure breaking down under the fingers. In patients who have fallen victims to typhus or hectic fever, the heart has been found equally soft and of a white or jaundiced yellow colour. Those who recover from such diseases are naturally very liable to be affected with aneurism of the heart, and hence the great care requisite to be bestowed in recruiting the strength of patients after fever. These softened states of the heart are occasionally the result of idiopathic affections, in which case the one resembles in its symptoms pericarditis or carditis, and the other chronic inflammation.

Chronic inflammation of the heart is extremely difficult of being ascertained before death, in consequence of the symptoms being generally referred to a distant part. Dropsy is a common concomitant, so also is cough, and more or less uneasiness or wandering pains in the thoracic

* See Morgagni and Marchettis.

cavity, accompanied with difficult and laborious breathing; but in some cases, the head is the chief part complained of, in others, the urinary bladder, in others again, dropsy of the abdomen, while in some others the uterine organs are affected. The pulse is generally small, weak, irregular, and sometimes intermitting. On applying the hand over the region of the heart, this viscus will be found to be acting irregularly. The morbid appearances are, fewer or more adhesions between the pericardium and the heart, with occasionally coagulable lymph, and even pus, and more or less softness and paleness of the heart. The treatment consists in early small bleedings, in the repeated application of blisters or issues to the sternum, and in cathartics.

Chronic inflammation is frequently accompanied with dilatation of the heart, rendering the disease very complicated. The dilatation appears to go on with rapidity, is accompanied with fever, and an acute pain is felt sometimes in the epigastric, at others in the hypogastric region. The pulse is frequent, irregular, and jarring.

White spots are frequently found on the surface of the heart, similar to those on the surface of the liver, which appear to consist of depositions of coagulable lymph, but cannot be traced to any local inflammation, however trifling.

Hypertrophia* is a thickening of the parietes of the heart without dilatation,† the left venticle being the cavity generally affected, and is characterized by the following symptoms: a confusion and struggling in the thoracic cavity, the palpitation being communicated to the region of the left clavicle, and when the hand is applied over the heart, it feels as it were repulsed by its pulsations. When

* Syn. L'irritation nutritive du cœur. † Syn. L'hypertrophie simple.

the region of the heart is percussed with the fingers, there is a dull obscure sound. To those who can use the stethescope dexterously, the pulsations appear very loud and strong, and can in some instances be heard at the back of the patient. There is an inexpressible anxiety and inquietude about the heart, together with a weak, irregular, fluttering, or vibrating pulse. The patient constantly apprehends instantaneous dissolution. Persons labouring under hypertrophia are often very fat. The treatment of this malady consists in small bleedings, issues to the sternum, active purges, low diet, reduction particularly of fluids, and quietness.

Hypertrophia is sometimes accompanied with dilatation or aneurism,* in which case the pulse is strong, full, and vibrating; at other times with contraction of the cavity,† in which case the pulse is generally regular, full, and strong, but occasionally feeble. Hypertrophia of the right ventricle is distinguished by the pulsations of the heart being felt at the inferior or sacral aspect of the sternum, and towards the right side, by bloody expectoration. That of the left ventricle, by the pulsations being felt between the fifth and sixth ribs of the left side, by the countenance being flushed of a vermilion tinge, by bleedings of the nose, by deafness and headach.

The heart is also subject to atrophy, or wasting of its muscular substance, which is frequently accompanied with general constitutional debility, particularly phthysis pulmonalis, and in these cases the pulse is small and frequent. The practitioner has to watch the pulmonary complaint, to prescribe moderate light diet, and to apply blisters to the sternum.

* Syn. L'hypertrophie excentrique : l'aneurisme actif.

† Syn. L'hypertrophie concentrique.

Aneurism of the heart consists in a dilatation of one or more of its cavities, that of the left ventricle being the most common when there is thickness of the parietes, while that of the right ventricle where the parietes are thin, and again that of all the cavities, is the most rare.

In some cases of aneurism, only one ventricle is affected, while in others only one auricle, the left auricle being the one most seldom affected. In aneurism of the right auricle, the tricuspid valve is so diseased by cartilaginous or osseous depositions, as to contract the aperture between the right auricle and right ventricle; in aneurism of the right ventricle, there is generally such a state of diseased lungs as to obstruct the circulation of the pulmonary artery, the semilunar valves of which vessel are rarely affected. In aneurism of the left auricle, the mitral valve is either cartilaginous or osseous, or both; and in aneurism of the left ventricle, the semilunar valves of the aorta are either cartilaginous or osseous. Although the preceding appearances are generally discovered in these various species of aneurism, and may be said to produce them, yet we occasionally find the cause very remote; thus a distorted course of the aorta from curved spine, has been found to produce aneurism of the right auricle and ventricle, particularly that of the former; so also has a contraction of the orifice of the aorta, and of the mitral valve. This dilatation is sometimes accompanied with hypertrophia or increased thickness of the parietes of the cavities.

Aneurism of either cavity, or all the cavities, with thickness or thinness of the parietes, is indicated in its commencement by pains in the region of the heart, palpitations, cough, and oppression of breathing, the latter of which is also short and high: the pulse at this period is little or at all affected. There is a feeling of hot flushings arising from the thorax to the face, which are very tran-

sient; the appetite is keen, and the digestion good, but attended with constipation. The patient is easily fatigued, and an oppressive breathlessness follows, which occurs most frequently on walking up a hill or up stairs. After the preceding symptoms have lasted for a few weeks, the palpitations become stronger and more frequent; the pulse is hard, vibrating, frequent, and sometimes contracted, when there is increased thickness of the parietes of the cavities; while it is soft, tolerably frequent, feeble and easily compressed when there is simply dilatation; the respiration is now extremely difficult, and the patient is compelled to sit and bend the body forwards, resting the chest on the knees, for he cannot breath in a horizontal posture; the cough is hard and frequent, and there is expectoration of viscid matter occasionally tinged with blood, the latter of which is sometimes spit up in a pure state. He feels a numbness which is sometimes followed by syncope, a constriction about the throat like the globus hystericus, and passes restless nights, being disturbed with frightful dreams. The appetite is still good, but the food excites pain and frequently vomiting, and the bowels become rather relaxed. The abdomen assumes the appearance of approaching ascites, the whole surface of the body looks pale and flaccid, but the face is bloated, the lips being of a violet colour. These symptoms are soon succeeded with more alarming ones, the pulsations of the heart are scarcely perceptible, and when felt are very quick; the pulse is small, frequent, unequal, intermitting, and hardly perceptible; the veins in the neck are swollen; the respiration is extremely difficult, suffocation being threatened every moment; there is a dry convulsive cough, with viscid bloody expectoration, or pure coagulated blood; the expectoration is occasionally, however, purulent. There is great debility, and anxiety, and no

hope of sleep, the patient being instantly awakened with delirium; the appetite is gone, and the stools are watery and frequent; there is universal anasarca, and ascites; and the patient either dies insensibly or in convulsions.

It will be readily acknowledged, that it must be exceedingly difficult to ascertain which cavity of the heart is affected with aneurism. Wherever there are the usual symptoms of aneurism of the heart, accompanied with expectoration of blood, a greater degree of breathlessness, more frequent faintings, a serous diathesis, the countenance of a violet colour, approaching to black, with fluctuation of the jugular veins, we may infer that the right cavities are those affected, all of which appearances are easily accounted for on the connexion subsisting between the right side of the heart and the lungs, and this side and the veins of the face and neck. When the left ventricle is aneurismal, the face is suffused with a lively deep red, and the pulse is more affected. But when the disease is well advanced, whatever be the species of aneurism, there is a general bloatedness of the countenance.

In simple dilatation, or aneurism of all the cavities, without either increase or diminution of the parietes, there is an oppression in the thoracic cavity, with the feeling of occasional suffocation; the pulse is full, slow, and soft, and the heart can be felt to contract sluggishly and equally in the thorax. These are generally attended with dropsical and dyspeptic symptoms. This affection is liable to be followed with chronic inflammation of the heart, or dropsy of the pericardium. In aneurism with hypertrophia of all the cavities, there is also oppression in the thorax, the pulse is strong, full, regular, and frequent, the heart pulsates hurriedly and violently, and the countenance is of a violet colour and somewhat livid. In both of these affections, rest, with abstemious diet, repeated

small bleedings, issues in the region of the heart, and attention to the bowels, are all that can be done.

Aneurism of the heart is occasionally accompanied with enlargement of the aorta, and sometimes but rarely with a contracted state of this vessel; in the former case, the symptoms are nearly the same as when the aorta is about its natural size; but in the latter or contracted state of the aorta, there is difficulty of breathing, a tendency to fainting, with an unequal pulse, accompanying the symptoms already enumerated. Towards the termination of the disease, a pain is felt in the region of the diaphragm, accompanied with cough, a languid frequent pulse, and vomiting.

The treatment of aneurism is the same as that for hypertrophia, with which it is often complicated.

A few rare cases have occurred, where there has been found in the parietes of one of the ventricles of the heart, a dilated pouch, lined with strata of coagulated blood, so as to resemble aneurism of an artery, the symptoms and treatment of which are the same as for the preceding kind of aneurism. The parietes of the heart sometimes rupture, without any previous disease, the ventricles being more subject to it than the auricles, and the left more than the right ventricle. This arises from some violent exertion, a fit of passion, an epileptic paroxysm, or in *actu coitus*. This occurs, however, oftener in diseased states of the heart, as aneurism, ulceration, softening of the fleshy parietes, and violent contusions. Sometimes there is only a rupture or laceration of some of the columnæ carneæ of the ventricles, a case of which is detailed by Corvisart, where one of the large columnæ which form the mitral valve was lacerated from its base, so as to float loosely in the left ventricle.

An aperture being found in the septum ventriculorum,

or the foramen ovale remaining pervious, is far from being an uncommon occurrence. Caillot mentions the case of a child eleven years old, where the foramen ovale remained open, and where there was an aperture in the septum ventriculorum large enough to admit the fingers. In this affection, which is termed the blue disease, from the face having a bluish tint, the patient has difficulty of breathing, frequent fainting, convulsive motions, and diminution of vital heat.

The heart has been, in some instances, converted into cartilage, and even ossified to a great extent; Bordenave mentions one case where the heart was almost entirely ossified; Haller details a case where the inferior part of the right ventricle, the valves of the pulmonary artery, the aorta, and the more fleshy parts of the left auricle were ossified; Burns found both the ventricles mere calcareous moulds; Albertini observed the right auricle ossified; Renauldin, in the "*Journal de Médécine*" for January 1806, relates a case, where he found the heart extremely hard and weighty, the left ventricle appeared changed into a real petrifaction, presenting in some places a gravelly appearance, and in others that of a saline crystallization, the columnæ carneæ being enlarged, and resembling real stalactites. The symptoms of this derangement of structure, are strong and frequent palpitations of the heart on the slightest motion: the pulse regular and full in the beginning of the disease, becomes gradually more feeble and intermitting, the breathing is extremely difficult, and attacks rather in paroxysms, obliging the individual to remain constantly in the semi-erect position, and there is great anxiety, much nausea, with frequent vomiting towards the conclusion of the disease. The patient is also occasionally tormented with pains in the abdomen and lower extremities, and there is more or less dropsical effusion.

As previously mentioned, the valvular structure is very subject to ossification; the semilunar valves of the aorta are most frequently affected; next to them the mitral valve; thirdly, the tricuspid; and lastly, the semilunar valves of the pulmonary artery. The semilunar valves of the aorta are sometimes so indurated as to remain touching each other, thus leaving the smallest aperture for the transmission of the blood; and the mitral valve, with its chordæ tendineæ and columnæ carneæ, have been found forming one continued osseous body, only permitting the smallest aperture possible between the auricle and ventricle. In those cases where the semilunar valves of the aorta are affected, the neighbouring portion of the artery is also involved. These states of the valves, as formerly mentioned, are almost always accompanied with aneurism of one or more cavities, so that the symptoms and treatment are the same. Besides these ossified conditions of the valves, they are often affected with a sort of fungous or warty excrescences, resembling cauliflower buds, complicated with other affections of the heart. When the semilunar valves of the aorta are ossified, strong and frequent palpitations take place, the pulse is irregular, undulating, rustling, obscurely trembling, and is often augmented by the force and frequency of the palpitations, the left ventricle being easily filled, but with difficulty emptied.

Polypus in the cavities of the heart seems a very rare disease, for the coagula found in the cavities, and entangled among the valves, are evidently merely the coagulable lymph of the blood after death. Polypus is to be distinguished from these by possessing a more uniform structure, and being free of any red globules. The symptoms of this affection during life, are irregular action of the heart, irregular pulse, and difficulty of breathing;

and they frequently resemble so nearly those of aneurism, as to be with difficulty distinguished. The treatment is almost the same.

Cancer, a tuberculated state, serous cysts, and vesicular worms, are described by a few authors to be found present in the heart. Cancer is peculiar to glandular structure, therefore its existence appears doubtful in muscular texture, unless soft cancer or medullary sarcoma is meant. Tubercles and serous cysts may exist, but it appears very doubtful if worms are ever present. Serous cysts are not uncommon.

The coronary arteries and vein are subject to the same diseases as blood-vessels in general; but ossification of the arteries, and a varicose state of the vein, may be considered the chief and most common affections which attack these vessels. The coronary arteries are sometimes so ossified, as scarcely to transmit enough of blood to nourish the muscular structure of the heart, one of them being obliterated, in which case the heart is unable to propel the blood freely and entirely out of its cavities, thus disposing it to hypertrophia, and even aneurism. The muscular structure of the heart appears pale and flabby in such cases, and is easily torn with the fingers. The symptoms are occasional palpitations, induced by passion, or by making any undue exertion, as ascending a hill or stairs; irregular pulse, sometimes full and strong, at other times weak and intermitting; violent pain in the region of the heart darting along the arms, even to the fingers, accompanied with difficulty of breathing, and a sense of suffocation when the paroxysm is severe. The patient cannot stretch himself so horizontally as in health. The treatment consists in avoiding every undue exertion, in abstracting small quantities of blood at intervals, in keeping the bowels gently open, and living on moderate

diet. A varicose state of the coronary vein not unfrequently accompanies hypertrophy, or aneurism of one or more of the cavities of the heart.

Malformation of the heart, and of the origin of the large vessels from it, is far from being an uncommon occurrence.

In the beginning of these physiological observations, the blood is stated to have two courses from the heart, the one by the pulmonary artery through the lungs, the other by the aorta, throughout the whole system. That which is circulated by the pulmonary artery through the lungs is named the lesser circulation, and when present in the animal, constitutes the double circulation: I shall defer the consideration of this, till I have explained the greater circulation, or that performed by the aorta. All animals, excepting some insects and zoophytes, have arteries.

The aorta, consisting of its three tunics,* proceeds to the different extremities of the body, dividing at different angles in its course, into innumerable branches, according to the organs which these are destined to supply. These branches or arteries branch off sometimes at

* In the opinion that the arteries consist of three coats, at least that they possess a muscular tunic, I am supported by Willis, Bidloo, Lancisius, Nicholls, Ludwig, Haller, Cuvier, Sir Everard Home, Dr. Young, Dr. W. Phillip, and Dr. Hastings. The cellular tunic is found to be proportionally greater in the larger than the smaller arteries, while the latter again exceed the former, in the proportion of their muscular tunic; the larger are therefore more elastic, while the smaller arteries are more muscular. Besides these three tunics, some arteries have an adventitious coat, thus the aorta within the cavity of the pericardium has the serous coat of the heart; without the cavity of the pericardium, some parts of the arch, and all the descending thoracic aorta, have the pleura, excepting that portion which adheres to the vertebræ. The abdominal aorta, and its division into the iliacs, are also similarly covered by the peritoneum. In the neck, the superior and inferior extremities, the arteries are enveloped, together with their accompanying veins, with a strong cellular sheath; the sheath in some places, as in the trunk of the external carotid and the popliteal arteries, being more delicate.

an acute angle, sometimes at a right angle, and at other times at an obtuse angle: the majority being at an acute angle. Organs which are destined to perform their functions rapidly, as the heart, have their arteries branching off at an acute angle, while those that are designed to do their office slowly, as the testis, have their arteries branching off at an obtuse angle. The velocity of the blood is greater, the more acute the angle of ramification is, and the less flexuous the artery is in its course,* also the less that arteries anastomose in the common manner; but the reverse, when they anastomose like the vertebral arteries, to form the basilar artery on the basis of the brain. By this union of the vertebrals, the velocity of the blood is augmented, and apparently to prevent congestion or pressure. In the frog's foot, two currents are observed sometimes to meet in the middle, and hence lose a corresponding momentum, which anastomosis appears designed to prevent congestion, and to afford a freer communication between one part and another. The blood flows with less velocity in the branches than in the trunks of arteries, in consequence of the increasing area of the branches compared with the trunk, the greater friction as it proceeds onwards, and the impinging against the angles of the ramifications; and with less velocity the nearer the angle is to an obtuse angle.

In the living body, when an artery is exposed, it is always seen filled with blood, and if punctured, the blood

* Some arteries are very flexuous, as the coronary arteries of the lips, the arteries of the uterus, those to the testis, those of the large intestines, of the iris, the umbilical cord, the spleen, tongue, stomach, and also the bronchial, carotid, and vertebral arteries. In some of the lower animals, there are other arteries extremely flexuous; thus the sloths have the axillary and iliac arteries dividing into a number of equally sized cylinders, which are very tortuous, and occasionally anastomose with each other. The arteries, when empty, are almost straight, but become flexuous when distended with blood.

flows in an interrupted stream. But although the arteries thus appear already filled, yet at every contraction of the heart they receive a fresh quantity of blood, from two to three ounces being propelled at each contraction of the systemic ventricle. When we press an artery between the fingers, that part of the vessel next, or proximad the heart, becomes turgid, while that distad or most remote, is emptied and flaccid; but on removing the fingers, the blood rushes into the empty vessel. The course of the blood is beautifully seen by placing the web-foot of the frog, or the tail of a fish, or the punctum saliens of an incubated egg, in the focus of the microscope. An artery, when laid bare, is never found collapsed or corrugated, but appears like a tense cord, thus resembling the collapse of the ventricles of the heart. Every fresh quantity of blood propelled into the aorta, gives an increased velocity to the blood in all the arteries of the body, which impulse is observed to occur at a period later, according to the distance of the artery from the heart. During the circulation, there is a dilatation of the arterial tube every where, in consequence of this regular increased quantity of blood from the heart, and this is greater in some arteries than in others; more so in those nearer the heart, than in those more distant. It is this which gives the sensation of pulsation felt by the finger. There is also a lateral dilatation or diastole of an artery, which dilating power gradually ceases from exposure to the air, the coats contracting and at last stopping the flow of blood. This dilatation does not take place in all the vessels at the same moment of time, as is verified at the neck, temple, and wrist; appearing later the greater the distance from the heart. After this partial dilatation, the artery returns to its former state, which constitutes the systole of the artery. Hence the arteries perform a diastole or dilata-

tion, and a systole or contraction, the same as the heart. From what appears by the artery of an amputated stump, jutting forward at every contraction of the ventricles, or by the artery when tied in aneurism, an artery is supposed to be elongated from the systole or contraction of the heart. This, however, only occurs when the artery is much insulated, so as to render the extreme point one of resistance, and to act as an obstacle to the flow of the blood; for this appearance is not evident when a small portion of an artery is laid bare.

The general cause of increased velocity is owing to the increased impulse given by the quantity of blood propelled into the arteries, which is exemplified in hydraulicks. The pulse is caused by the blood thrown into the aorta impelling all the rest of the fluid before it into the arteries, the same effect occurring with water in a leathern tube of a fire-engine, at each stroke of the double pump, and the parabola of the jet being thereby increased. This dilatation is satisfactorily accounted for, on the principle of the arteries being elastic tubes, and possessing greater elasticity in the longitudinal than in the transverse direction. The heart forces more blood into the arteries than it can give out at opposite extremities, therefore the arteries must dilate to make room for the increased quantity of blood; and the quicker the impelling power, the greater will be the dilatation. When the arteries again contract, their elasticity keeps up the flow of blood, till a new impulse is given by the heart, which results from these vessels tending to return to their former collapsed state, like the ventricles of the heart.

These two powers, the action of the heart, and the elasticity of the arteries, seem alone capable of carrying on the circulation; on the same principles as the fire-engine, where the impulse is given by working the pump, and

continued by it and the elasticity of the tubes. But the arteries possess muscular contraction; they are capable of being stimulated, so as to evidence sensibility and motion. That they possess muscular fibres, may be demonstrated on the middle-sized arteries of man, and many other animals. This muscular tunic, I have already observed, is allowed by Willis, Bidloo, Lancisius, Nicholls, Ludwig, Haller, Sir E. Home, Drs. Young, W. Philip, and Hastings. Haller and Spallanzani found the circulation carried on for some minutes in many cold-blooded animals, in fishes, and in the incubated egg, after the destruction of the heart. In fishes, the blood describes three circles in the liver; and in all other parts, excepting the gills, it describes two circles, before returning to the heart. In cold-blooded animals, the circulation continues in the capillary arteries, after the heart no longer propels the blood.* In insects and zoophytes, where no heart exists, the vessels analogous to arteries circulate their fluids. In all the worms having red blood, and which have no hearts, the systole and diastole of the arteries is well marked. In the lumbricus terrestris, where there is no heart, the blood is solely propelled by the muscularity of the arteries. The lumbricus marinus has no ventricle, the blood being propelled by the blood-vessels of the organs of aeration; and in human monsters, where no heart is present, the blood is propelled by the arteries.† When the aortic valves are ossified, the heart contracts sometimes twice for each pulsation of the arteries. Bordenave found the heart in one instance

* Bichat, Recherches Phys. sur la Vie et la Mort.

† See Memoires de l'Academie des Sciences, 1720, par Mery; Memoires de l'Academie des Sciences, 1740, par Winslow; Com. Soc. R. Sc. Gotting. tom. 4, com. 4, Roederer; Trans. Roy. Soc. Edin. vol. 3, Monro; Phil. Transact. 1793, Clarke; Phil. Transact. 1767, Le Cat.; Medico-Ch. Transact. vol. 1, Young; Phil. Transact. 1809, Brodie.

almost completely ossified; Burns found the ventricles mere calcareous moulds, and Renauldin found the left ventricle converted into a real petrifaction, the columnæ carneæ resembling stalactites. These physiologists also found that the circulation in the arteries varied in different parts of the system in many animals, as the palate, lungs, and mesentery. Haller found that the arteries circulated their fluid in a retrograde direction, when cold, fright, inflammation, or wounds occurred, which fact is corroborated by the experiments of Lewenhoeck and Spallanzani. Spallanzani found that the blood flowed in a retrograde direction along the aorta to the heart, when an incision was made into the latter, although the animal, a salamander, was placed perpendicularly, and hence the blood had to ascend. In the same animal he observed that the action of the heart and aorta was seldom synchronous. He found that the velocity of the circulation in the trunk of the pulmonary artery, compared with that in the ultimate branches, was as three to one; while he perceived no difference between the velocity of the blood, in the small vessels on the surface of the gall-bladder, and that in the large arteries. He observed that the large and middle-sized arteries propel their blood during the diastole of the heart. Haller, in his observations on the motion of the heart, says, "Is motus totus in contractione ponitur, qua eadem communis omnium musculorum functio absolvitur;" which, in my opinion, is equally applicable to the arteries. That the arteries possess sensibility, is proved by their being plentifully supplied with nerves, and consequently capable of being excited by stimuli, of which the blood is their natural stimulus.* In many cases of para-

* The only exceptions to this are the umbilical and placentary arteries, both of which have lately been discovered to possess nerves, by that indefatigable physiologist, Sir Everard Home. Phil. Trans. for 1825, Part I.

lytic limbs, no pulse has been felt,* shewing that the arteries, when deprived of their nervous influence, cannot contract to circulate their fluids, and that the heart alone is unable to perform the function of circulation. Sir Everard Home proves from his experiments, that the arteries, like other parts of the body, are totally dependent on the nerves for their capability to perform contractile motion, and hence, that the nerves which accompany the arteries regulate their actions.† That they possess muscular contraction, is proved by their having a muscular tunic; and where muscular fibres exist, they must be capable of action, because if we deny this in one place, we are equally entitled to do it in another. That they evidence sensibility and muscular contraction, is established not only by what I have already advanced, and the numerous other experiments performed by these physiologists and others, but by what may be observed in the face, arms, neck, and breast of the female in blushing, by the local determination of blood in suffusion of the eyes from sand, and by erection of the penis, either from direct irritation, or from the idea of a voluptuous woman in the mind. These latter actions take place in an instant of time, and they cannot be explained on the elasticity of the arteries, or the action of the heart, for the latter in many cases is not increased in its motions. The arteries in these actions must suddenly act, which can only be effected by muscular action. Besides these, there is the state of the arteries in the heads of those animals which shed their horns; the state of the uterine vessels during gestation; the state of the arteries in the secretion of milk, and the growth of tumours; and the state of the arteries leading to inflamed

* See Storer in Trans. Soc. Med. Chir. Know. vol. iii.

† Phil. Trans. 1814.

parts, as the carotid of the affected side in cynanche tonsillaris.

The middle coat of the arteries being muscular, enables us to comprehend how these fibres will assist the action of the heart, and the elasticity of the arteries, and thus render the extreme branches of these vessels less dependent on the heart; for at no period, and in no part of the arterial system, do we find all the fibres either in action, or in a state of relaxation, but some active in one quarter, and others relaxed in another. It is only in this way that we can satisfy ourselves respecting the sudden actions of insulated portions of the arterial system, and account for the occurrence of all those topical congestions and local palenesses: hence the velocity of the blood in some arteries is greater than in others. The arteries, besides nervous filaments, have lymphatics, and numerous vasa vasorum, or very small arteries and veins, on their tunics, two essential agents in muscular motion.

I formerly remarked that the arteries divided at different angles into numerous branches, which again subdivide into smaller arteries, named capillaries, the majority of which terminate in the veins; some, however, join the veins at an earlier period. This termination of the capillary arteries in veins, can be demonstrated on the pia mater of the human brain, on the tail of a fish, on the web-foot of the frog, and the gills of the salamander and frog. Not only in these, but in other animals, this termination or junction of arteries in veins, has been witnessed by many physiologists, among whom may be mentioned Harvey, Lewenhoeck, Bernouilli, Cowper, Malpighi, Hales, Haller, and Spallanzani.

A second termination of the capillary arteries is into exhalants. These either open into some cavity, as the ventricles of the brain, the nostrils, bag of the pleura,

pericardium, mouth, stomach, intestines, gall-bladder, urinary bladder, uterus, vagina, pouch of the peritoneum, and tunica vaginalis testis; or the exhalation takes place in the skin, eye-lids, and tunica conjunctiva of the eye, and sometimes into tubes and true glands; or these vessels terminate by pores or very short channels or canals, as illustrated in the little cells of the cellular tissue, or in the aerial tubes of the lungs. Almost all the membranes of the body secrete an exhalation, as the dura mater, the pia mater, the pleura, pericardium, peritoneum, &c. The simple experiment of Haller, the insertion of an injecting pipe into one of the venæ cavæ, and the propelling of a coloured liquor, which flows into the heart and pulmonary artery, and escapes at the trachea, illustrates this kind of secretion. Another species of exhalation is by lacunæ and true glands.

A third termination of the capillary arteries is in excretory ducts, which carry a fluid different from the blood, and do not return it to the heart. Some carry their fluids into the aerial tubes of the lungs, some into the stomach, others into the kidneys, and others again out at the skin. Neither Lewenhoeck, nor any one else, excepting Bertin, has witnessed the arteries becoming excretory ducts. It is easy, however, by injecting water into the renal artery, to make it flow into the ureter.

The capillary arteries have been also found to communicate with the lymphatics, as described by Caspar Bartholinus, Borrichius, Nuck, Cowper, Walther, and Haller. These terminations and communications of the arteries will be particularly considered under secretion and absorption.

Arteries convey differently-coloured blood, not only in different animals, but even in the same animal; some insects, as the grasshopper, circulate green blood; some

crustaceous animals, as the lobster, circulate white blood, while the vertebral animals circulate red blood. In man, and many animals, the small arteries of the crystalline lens, vitreous humour, and tunica conjunctiva and cornea of the eye, circulate colourless blood. Haller and Spallanzani talk of the red and yellow artery, the latter being merely a continuation of the former, and consequently smaller, and therefore containing less red blood, or having this colour less concentrated.

Arteries pervade every structure of the body, excepting the tunica arachnoidea of the brain and spinal marrow, the epidermis, the nails, the hairs with the exception of their bulbous roots, and the membranes of the umbilical cord. It is presumptive, however, that both in the arachnoid coat, and in the membranes of the umbilical cord, arteries are present, but that they convey colourless blood, for these become inflamed, and undergo other diseased changes.

The arteries anastomose with each other from the crown of the head to the sole of the foot, and particularly about the joints,* but only with their small branches, excepting the vertebrals, which unite to form the basilar artery.

The various causes and agents which we have mentioned as influencing the heart, must also operate on the arteries, from the one being as it were a continuation of the other. The regular as well as the irregular actions of the heart are all indicated either by the motion of this organ felt immediately over its situation, or by the motion of the blood in one of the arteries, as at the wrist or temple, which motion is termed the pulse. This when regular,

* The free inosculation of arteries should be considered by the operating surgeon in aneurism.

beats the same as the heart, a scale of which from birth to old age is given in page 145, and should be well committed to memory. Although that scale may be considered as a standard to regulate generally our conduct, yet the pulse varies exceedingly in different individuals in health. In some persons at middle life the pulse is seldom higher than 40 in the sitting posture, while in others it is never below 96 or even 106; for it varies much according to our position. I am acquainted with a gentleman who enjoys good health, and who has been many years in a tropical climate, whose pulse while in bed in the morning is 90, but whenever he gets up, it rises to 120; and after breakfast it mounts to 140. Dr. Fordyce mentions the case of an old man whose pulse was naturally only 26 in the minute; and a patient in Guy's hospital about 65 years of age had a pulse of only 16 in a minute: such is the discrepancy in the pulse.

The pulse, during any irregular action, as palpitation of the heart, is always increased in number. The pulse varies in size or fullness, according as the distention or diastole is greater in both the heart and arteries, which fullness or largeness is judged of by the impression conveyed to our fingers. It also varies in the time which is employed in the distention or diastole of the artery. When this takes place quickly, it is termed a strong pulse; and when slowly or gradually, a weak pulse. The pulse also varies in point of regularity, the intervals between the pulsations differing in length, which irregular pulse is divided into unequal and intermitting. It is said to be unequal, when for a number of pulsations the pulse beats quickly, and after a while, more slowly for another number of pulsations, forming a regular series, although neither of the series continue the same length of time. The pulse is named intermitting, when it beats in regular succession,

but stops or intermits at times, one, two, three, or more pulsations. These two latter, the unequal and intermitting, are occasionally combined, nay all of these varieties are sometimes variously combined.

The quick pulse may depend on increased sensibility and motion of the heart, from any cause that increases the frequency of the contractions of the heart. It may also depend on the stimulant power of the blood; and likewise on an increase of the velocity of the flow of the blood in the veins.

The slow pulse is caused by moderate diminution of the sensibility and motion of the heart, by diminution of the stimulant power of blood, and by less velocity in the flow of the blood in the veins.

As the arteries themselves possess a structure similar to the heart, evidence similar phenomena, and are capable of being influenced by the same causes, they must assist in producing these effects, or, in other words, they must aid in rendering the pulse quicker or slower.

The varieties in fullness of the pulse is caused by a greater quantity of blood being present in the artery when distended, which may be produced by an increase in the quantity of the blood sent from the heart, or by a greater velocity being given to this blood. It may also arise from more blood being present in the artery, when a fresh supply is propelled from the heart; or when there is plethora in all the arterial system, which plethora, however, may be partial, and confined to particular parts. The pulse is rendered fuller by the same means that it is rendered quicker, namely, the increased action of the heart, the increased stimulant power of the blood, and an increase in the velocity of the blood in the veins. It may be also rendered fuller by any impediment to the flow of the blood in the arteries.

Small or slender pulse is necessarily caused by the reverse of what produces fullness of the pulse.

The varieties in strength and weakness of the pulse depend on the combined action of the heart and arteries; which varieties depend chiefly on the difference of time the arteries take in being filled, and less on the action of these vessels; and by ascertaining the time which the artery takes in being filled, we can calculate the quickness of action of the ventricles of the heart.

The intermitting pulse appears to be caused either by no blood, or so little being sent from the ventricles, that it produces no dilatation in the arteries to render a sensible impression on the fingers. This may depend either on no action, or too weak an action of the ventricles, or it may depend on a sudden spasm preventing their receiving any blood from the auricles, or upon such an obstruction between the auricles and ventricles, or between the ventricles and arteries, as to prevent their receiving a sufficient quantity of blood.* Polypus, or ossification of the tricuspid, mitral, or semilunar valves, or aneurism of the arch of the aorta, produces nearly the same effects.

Too small a quantity of blood leaving the heart, seems to be the most frequent cause of intermission of the pulse. This frequently occurs where the heart is quite healthy, as in those having weak stomachs, which are often disordered, and in nervous people. In the nervous habit, it must depend on too feeble action or spasm of the heart. Immediately after intermission, there generally takes

* In Medico-Chirurgical Transactions, vol. i. Mr. Abernethy details two cases, where the communication between the left auricle and corresponding ventricle was so small, as to impede the flow of blood: the auricle was double its size, and the ventricle smaller than natural. The pulse was extremely small and frequent in both. I examined the heart of a middle-aged lady, where the same appearances were found, and where the pulse was during life also exceedingly small and frequent.

place an increased effort of the heart, which causes a greater action.

The arteries seem to possess a power inherent in themselves of acting, without calling into action the heart, the contractions of which continue naturally the same; and in this independent action the veins participate. This independent action of the arteries is ascribable to the nerves, for all motion begins in the latter. This phenomenon is beautifully elucidated in the eye, where the transparent, almost invisible vessels, on the tunica conjunctiva, become, from any exciting cause, red in a few seconds, by immediately enlarging. It is illustrated by the act of blushing in the young female, where the face, neck, bosom, and arms, become in a moment suffused; by the application of hot water, or a heated metal, to a small part of the face, instantaneously producing redness; and by the penis being injected immediately with blood, from local irritation, even in sleep. The application of cold produces a similar appearance; the nerves are chilled, causing a suspension of their action, at the same moment that the capillaries are constricted, thus increasing the resistance; so that the nerves are excited, and the arteries are immediately after overcharged. In these actions, the arteries are excited to contract with more vigour and celerity, and consequently propel the blood with more quickness, and in greater quantity, than ordinarily.

When this action lasts for any time, it is named a local determination of blood;* but when pain accompanies it, it is styled inflammation. In the latter, the nerves are excited to greater action, and the contractility of the arteries is soon by over-action enfeebled, so that these

* A local determination of blood increases the bulk of the part, by depositing new substance.

vessels enlarge and circulate a greater quantity of blood. The blood, however, appears to flow with increased velocity, which is caused by that part of the artery immediately contiguous, or leading to the inflamed and dilated portion, being morbidly excited. The artery of an inflamed part, therefore, is at first smaller than during health, in consequence of the spasmodic action of the nerves, and the distention of the vasa vasorum, diminishing the calibre of the vessel, but very soon becomes enlarged, from the nerves being partially exhausted, and the vessel over distended with blood; while the portion leading to the inflamed part is contracted in diameter. The increased quantity of blood circulating in an inflamed part, is the cause of the redness, and partly the cause of the increased heat. Nearly the same effects take place, only in a less degree, in local determination of blood, or what is sometimes styled congestion; for when the capillary arteries are partially constricted or obstructed, inflammation may supervene.

In inflammation of any degree, the heart and the whole circulating system are involved, and constitute inflammatory fever; sometimes the quickened pulse precedes the appearance of the inflammation, while at other times it follows. In the former, the increased circulation, from whatever cause, so excites the nerves and arteries, that they are incapable of returning to their wonted quiescence, and the inflammation may be either partial or general, according as there is any part of the body feebler than another. This is satisfactorily verified in those who have once had any local inflammation, having always that part attacked more readily than any other, in any increased action of the heart and arteries. In the latter, or when the quickened pulse follows the inflammation, the heart and arteries are excited by the diseased action of the

nerves of the part being transmitted along the nerves to the heart.

The treatment of local inflammation is by leeches, or cupping, warm anodyne fomentations, and poultices:* applying the leeches in great numbers, and repeating the fomentations and poultices, as often as they become cool.

The treatment of general inflammation is by general blood-letting, warm-bath, or warm sponging, saline purges, acidulated drinks, low diet, and perfect quietness in a darkened or dark chamber. The blood-letting, at the onset of the disease, should be carried to syncope, and repeated every four hours till the pain is removed, for this symptom is the most to be depended on, and is the best criterion of this case; the pulse and buffy blood† may almost be thrown out of consideration. The warm-bath, or sponging with warm water, should be repeated as often as the skin indicates preternatural dry heat. Salts ought to be given much diluted, and often enough to produce two motions in the twenty-four hours, while pain is present, and one daily when this is subdued. The acidulated drinks may be made of super-tartrate of potash, tamarinds, or green fruits. Low diet is vegetables plainly boiled, green fruits, and plain cold or toast-water. From what has been said, it will be at once understood, that the local inflammation may become general, and require the combination of these treatments.

* Sir Everard Home's experiments on the influence of the nerves upon the arteries, incontestably prove the superiority of warm applications over cold, to inflamed surfaces.—Philos. Trans. 1814; see also Dr. Wilson Phillip, in Philos. Trans. 1815; and Le Gallois sur la Principe de la Vie.

† Many a patient is made a victim by the practitioner giving too much weight to buffy and cupped blood. This appearance depends on increased absorption, therefore it is more exhibited at the last scene of life, than in the beginning of disease.

In inflammation of almost any degree, the capillary arteries are modified by the nerves, to secrete coagulable lymph, which generally favours the inflammatory action by moderating it. When this action is more violent, the capillaries are modified by the nerves, so as to form small papillæ, named suppurative, which secrete purulent matter; and when the inflammatory action is extremely violent, the nerves, arteries, and contiguous textures, are so destroyed in their structure, the two former by inflammatory exhaustion, the last both by this and by being gorged with blood, which coagulates, in consequence of not being kept in motion: this constitutes gangrene, or mortification; sphacelus being the further stage, or separation of the gangrened part. These are the common and general terminations of inflammation; the first, or the secretion of coagulable lymph, which generally accompanies a natural quiescence of the inflammatory action, is termed resolution, although resolution may take place without effusion of coagulable lymph. When coagulable lymph is thrown out, and becomes a bond of connexion, as in pleuritis, the termination is named adhesion; the capillaries shoot into the lymph, and render it an organised mass: and when lymph is effused into a recent wound, and becomes a similar bond of connexion, it is termed union by the first intention; the capillaries here performing the same part as in the former. The second termination, or the secretion of purulent matter, is named suppuration; and the third, or destruction of the different textures inflamed, is denominated mortification. Besides these, there are other terminations. When the suppurative papillæ are exposed by rupture and absorption of the integuments, the disease is named ulceration, of which there are many varieties, depending either on local circumstances or on constitutional causes. Ulceration may also take place in cavities, as in the thorax; in

which case there are ulcerative papillæ, or the suppurative papillæ perform what is named the ulcerative absorption, *i. e.* the papillæ secrete pus, while the absorbents are excited to remove the contiguous structure, so that there is active absorption and secretion going on. When inflammation attacks the serous membranes, as the pleura or peritoneum, the exhalants are sometimes rendered so debilitated, that they secrete more than their natural quantity, and of a more watery consistence, which constitutes effusion or dropsy. This disease may also be caused by diminished absorption, or by both increased exhalation and diminished absorption. When this action attacks glandular structure, the arteries secrete a peculiar condensed cartilaginous structure, named schirrus, or carcinomatous sarcoma, which, when accompanied with pain, forms occult cancer. The capillaries in various parts of the body, and in various textures, secrete differently diseased substances, forming a variety of tumours, as tubercles, the common vascular or organised sarcoma, the adipose sarcoma, the pancreatic sarcoma, the mammary sarcoma, the tuberculated sarcoma, and the medullary sarcoma, or fungus hæmatodes; also the different kinds of encysted tumours, as the steatoma, melliceris, and the atheroma.

When suppuration follows active inflammation, and the matter is confined by the surrounding parts, it is named an acute abscess; a free incision should be made to evacuate the fluid, and the part afterwards treated with simple dressings, or lint spread with simple ointment, and bandage. If the suppuration has been extensive, nourishing diet, and, as soon as possible, exposure of the patient to the open air, will be requisite. As the part becomes ultimately an ulcer, I shall defer saying any thing

further until I come to the consideration of the skin. When suppuration is slow in its progress, and preceded by chronic inflammation, which is merely a slow action of the inflamed vessels, in this case, a small opening should be made with a lancet, the wound either healed up, as directed in page 121 of Part V., or allowed to remain open, and the parts properly supported by compresses and bandage. Nourishing diet, and exposure to the open air, are powerful auxiliaries in the cure.

In mortification, the application of simple warm poultices is far preferable to stimulants, for the gangrened part cannot be saved, but must sphacelate; so that our object is still to subdue the contiguous inflamed part, and thus prevent a further extension of the gangrene: consequently, the low diet, gentle laxatives, and acid drinks, should be continued, unless diarrhœa is present, when the latter should be given up, and astringents administered. When sphacelus is perfectly established, the part may be removed, but not too near the gangrened surface. In extensive gangrene, as that of a limb, arising from external injury, amputation is proved to be salutary.* The treatment of the other terminations of inflammation will be detailed when we come to the structures they affect.

When any obstruction takes place in an artery, either from coagulated blood, pressure, or the application of a ligature, the limb does not die for want of blood, because the circulation is carried on, however feebly, by the anastomosing branches: the latter gradually enlarge, until the communication between the upper and lower parts of the

* Mehee, Traité des Plaies d'Armes à Feu, Paris, 1799; Larrey, Memoires de Chirurgie Militaire, tome iii.; Lawrence, Medico-Chir. Trans. vol. vi.; A.C. Hutchinson's Practical Observations on Surgery; Mathews, in Edinburgh Medical and Surgical Journal, vol. xix. p. 205.

limb is completed. The blood, in the first part of this process, stimulates these anastomosing branches, next gradually enlarges them, and lastly, by this increased determination, gives them proportionate strength. The vessels appear to be modelled to perform their new and more important task.* Sometimes, however, these anastomosing vessels are incapable of carrying on the circulation sufficiently, and the limb dies from mortification.

When an artery is secured by a ligature, the two internal, or the serous and muscular coats, are either partially or completely cut through, while the external or cellular coat remains sound; a moderate degree of inflammation is next excited, coagulable lymph effused, and union of the opposite sides of the artery effected by adhesion. Sometimes, however, instead of this healthy termination, the inflammatory action is too violent, and ulceration occurs, which is followed by hemorrhage. The serous coat of an artery is the most easily inflamed, and the most subject to disease. When injecting a limb in the dissecting-room, great care is requisite to avoid rupturing the serous and muscular coats, and to prevent the injection flowing into the mesh of the cellular tunic, or into the cellular or muscular substance in the contiguity.

When an artery is obstructed by the internal or serous coat separating and plugging up the calibre of the vessel, or from coagulated blood, the vessel above this obstruc-

* Cases are detailed where the aorta has been obliterated, and yet the circulation carried on by the other vessels. See Stanzel's Dissertation de Steatomatibus Aortæ; Meckel, in the Memoirs of the Royal Academy of Berlin, for 1756; Stoerk, in Medical Annals, vol. ii.; Dessault's Medical Journal, a case by Paris, tome ii.; Medico-Chirurgical Transactions, vol. v. a case by Dr. Graham. Sir A. Cooper tied the aorta first in the dog, Medico-Chirurgical Transactions, vol. ii., and then in the human body; the man lived for several hours after, Surgical Essays, vol. i. See also a case by M. Crampton, surgeon-general at Dublin, in Dublin Hospital Reports, vol. ii.

tion either dilates or ruptures, and produces aneurism. In the case of the artery simply dilating, either from the preceding causes, debility of its coats, an undue impulsion, or any other cause, the disease is styled true aneurism;* which species is most frequently met with in the arch of the aorta, and occurs likewise in the thoracic and abdominal portions, at the division of the carotid and the iliac arteries, and also in the arteries of the brain. But this is not properly considered true aneurism, which is a disease consisting of a dilatation of the coats forming the sides of an artery; the present affection being a simple dilatation of an artery, and when it occurs in the ascending aorta, the coats are thickened and covered with atheromatous and calcareous depositions. The symptoms of this dilatation of the commencement of the aorta are the same as those of aneurism of this part, and so also is the treatment. But this is a species that seldom occurs, for the internal or serous coat, together with the muscular, rupture in consequence of their brilliancy, or from inflammation and ulceration, or mortification, or partial dilatation; or absorption of these two tunics takes place, in consequence of some diseased spot, which appears of a blackish colour, and slightly inflamed,† while the external or cellular coat alone is dilated, constituting what is named by some writers true, and by others false aneurism. When the cellular coat of the artery is ruptured, the blood is then only confined by the loose cellular sheath of the artery, which also yields; the walls of the sac are then formed by the surrounding parts, which have been con-

* Morgagni, Pelletan, and Larrey, are of opinion, that syphilis is a predisposing cause of aneurism.

† In many subjects brought into the dissecting-room, where an aneurism was present, these black spots or tubercles have been found in many arteries. They appear to be an effusion of blood from the vasa vasorum.

solidated by the previous inflammatory action excited by the distention of the tumour. The sac, however, sometimes bursts before these adhesions are sufficiently strong, and the blood is injected among the surrounding soft parts. When the aneurism advances to the skin, the integuments slough and ulcerate, and the patient dies of hemorrhage; the same process takes place in the trachea, œsophagus, stomach, and other mucous structures; while, when an aneurism bursts through a serous membrane, as the pleura, the latter is lacerated. When an aneurism presses upon a bone, the latter becomes carious. In the event of the cellular tunic of the artery rupturing, and the blood diffusing itself in the contiguous cellular substance, the disease is denominated by some simply false aneurism, and by others diffused false aneurism, to distinguish it from the preceding, which is then named the circumscribed false aneurism. This false aneurism, or diffused extravasation of blood, is more generally produced by an artery being wounded with a sharp pointed instrument, so that the blood escapes at once into the surrounding soft parts.* The parts of the arterial system most subject to the second species of aneurism, or that wherein the serous and muscular coats are ruptured, and the cellular dilated, are the arch of the aorta, the external carotid artery, the axillary, the brachial, the femoral, and the popliteal arteries. The symptoms of this disease, when it attacks the arch of the aorta, are, difficult, frequent, laborious, and whistling respiration, the inspirations appearing never to be complete, thus

* The opinion of the majority of surgical writers of the present day, is, that true aneurism consists of a rupture of the serous and muscular, with a distention of the cellular coat, and that this rupture takes place in the side of the artery. In aneurisms of some magnitude and continuance, however, I have seen the whole area of the artery involved, and the serous coat distributed in patches over the tumour.

resembling those in asthma, and also occurring in paroxysms, particularly when walking, on which occasion there is frequently a sense of suffocation; frequent cough, with occasional expectoration of mucus streaked with blood; pain at the sternum; intermitting pulse, which, however, is sometimes very variable, being occasionally soft, full, and frequent, and different at the two wrists; face more or less livid; the extremities ædematous; and the patient unable to lie on the back in the horizontal posture. When percussion is employed, the thorax does not sound on the middle and upper part of the left side; and when the hand is applied, a rustling and trembling is felt. This disease is often mistaken for an affection of the lungs; and I have seen it mistaken for hydrothorax. In some cases, the tumour presses outwards, and generally on the left side of the thorax; one instance of which occurred in a woman, representing the appearance of two mammæ on one side. I took a drawing of the case, and have preserved the preparation in my Museum. The treatment of this fatal malady can only be palliated by occasional bleedings, low diet, gentle exercise, and attention to the bowels. A tangible aneurism, if I may use the expression, is characterized by a pulsating tumour in the region of an artery, with the pulsation of which it corresponds, attended with pain in the seat of the tumour; and when in the lower extremity, feebleness and pain in walking. When in bed, the patient is attacked with cramp, and sudden twitchings in the legs, which prevent him sleeping. The tumour, when examined, contains arterial blood, generally partly fluid, and partly in layers of coagula; it is only in those small true aneurisms, that the blood is entirely fluid. Patients are frequently affected with more than one aneurism, showing that there is a general affection of the arterial system. This species may be treated either by

compression or an operation; if the former be adopted, sponge as a compress, with a bandage rolled from the distal to the proximal end of the extremity, will be found the best. For a detail of the operations to secure the different arteries, the reader is referred to Parts II. and III., where each is minutely described.

Besides these diseases, arteries are subject to inflammation and its terminations, as adhesion, suppuration, and gangrene; and are also frequently involved in inflammation, and other diseases of contiguous structures. The internal or serous coat is sometimes found of a deep-red colour, with a deposition of coagulable lymph, appearances which have been witnessed in the aorta in severe cases of pneumonia, carditis, and bronchitis. In some cases, the cellular membrane connecting the coats of the aorta have been found distended with lymph. The application of a ligature to an artery in amputation, or for the cure of aneurism, has occasionally produced so great a degree of inflammation as to extend to the heart. The ligature on the umbilical cord sometimes excites inflammation along the hypogastric or umbilical arteries. The arteries are not unfrequently deeply tinged, of a red colour, from transudation of the blood; but when the internal or serous coat is detached, the muscular presents no unnatural colour, there is no deposition of lymph, and no thickening of the coats of the vessel. As this state of the arteries is a concomitant of other acute diseases, the practitioner is directed to their symptoms. Should he suspect inflammation of the artery, or arteries, the antiphlogistic treatment will require to be more vigorous.

In the vicinity of ulcerations, thickenings, or calcareous depositions of arteries, the vessel is generally inflamed, which must be considered chronic; the internal coat of the artery is of a deep red colour, and is softer and thickened.

This condition of arteries occurs commonly in aneurismal subjects, whose diseased state of the arteries is complicated with syphilis. The effusion of coagulable lymph and the adhesive inflammation, have already been considered; but I may here observe, that Nature, with her infinite wisdom, has by this process preserved the lives of many for several days, as in phthisis pulmonalis, where, when the substance of the lungs is nearly entirely consumed, hemorrhage is prevented by the closure of the branches of the pulmonary artery, through the means of effusion of coagulable lymph, and the adhesive inflammation; but where the ulceration is so rapid, as to prevent this adhesive process taking place, hemorrhage ensues, which becomes more or less serious, according to the magnitude of the artery.

Suppuration is seldom witnessed, in consequence of the matter being washed away by the blood; but ulceration is often met with in arteries affected with calcareous and atheromatous depositions. This condition of arteries frequently gives rise to aneurism, to apoplexy, hemoptysis, hematemesis, &c. This state often occurs in phagedenic ulcers.

Gangrene of a limb involves the arteries, together with the other textures, but inflammation of an artery seldom or never ends in gangrene.

The serous coat of arteries is sometimes converted into cartilage, sometimes into a thickened pulpy structure, like steatoma, sometimes into an atheromatous substance, which is however deposited between the serous and muscular tunics.

Ossification of the arteries, or a deposition of calcareous matter, is a very common result in old age; sometimes, however, it occurs in very early life, even at fifteen months. All the old subjects which come into dissecting-rooms,

have their arteries from the aorta to the arteries of the brain, arm, and leg, covered with calcareous depositions, which begin on the outer surface of the serous coat. This change of structure is the most common cause of spontaneous aneurism, and is a frequent cause of apoplexy, hemoptysis, and mortification of the inferior extremities. Calcareous depositions take place principally in the arteries of the trunk, in the branches of the carotid and iliac arteries, and more frequently in the second and third orders of arteries, than in their ramifications. The pulmonary artery and valves are seldom affected; and the upper extremities much more seldom than the lower. In maniacs, the arteries of the brain are generally ossified.*

Hemorrhage from a wounded artery is to be stemmed by various methods, which vary according to the magnitude and number of the vessels injured; but it may be laid down as a law in surgery, that wherever an artery is large enough to pour out such a quantity of blood, as to weaken in the least the patient, it should be secured by a ligature above and below the seat of the wound. Where a vascular surface is wounded, in which the blood-vessels are extremely small, where they are merely capillary, as, for example, the mucous membrane of the nares, styptics, with compression, and a bandage, where it can be applied, should be employed. The styptics used are cold water, vinegar and water, a solution of the sulphates of zinc, copper, or iron, the mineral acids diluted, alcohol, alcohol and sulphuric acid combined together. In all contused wounds, where arteries are injured, compression should be used, and if found ineffectual, the artery leading to the injured part should be secured by ligature, but never at the seat of the injury. This is well exemplified

* Marshall on Mania and Hydrophobia.

in the palm of the hand and the sole of the foot. Compression is produced by lint, dry sponge, sponge-tent, agaric, and bandage, and is the remedy employed in hemorrhage of the plantar or palmar arteries, the internal pudic artery in lithotomy, the intercostal arteries, the temporal artery, and the extreme branches of the internal maxillary artery, after the extraction of a tooth. The actual cautery is employed after the extraction of tumours from the antrum maxillare, the gums, palate, &c. When hemorrhage occurs in any of the large cavities, as the cranium, the thorax, and abdomen, the patient is treated with bleedings from the arm to produce syncope, with depressing narcotics, as digitalis and hyosciamus, together with gentle laxatives, low diet, and perfect rest. When the cranium is the seat of the hemorrhage, we often trepan in the region of the middle meningeal artery, in the expectation that it is the source of the hemorrhage. When in the thorax, we can only have recourse to the general remedies mentioned; but when in the abdomen, if the vessel be conjectured to be so large as to endanger life, which may be calculated to be the case, by syncope becoming more and more alarming, we ought to lay open the cavity, and secure the wounded vessel; "satius est enim anceps auxilium experiri quàm nullum."

Hemorrhage has proved fatal even from the gums, or the nares: when from the former, it has been after the extraction of a tooth, and then sponge-tent, wedged between the contiguous teeth, and the jaws firmly bound together by a roller, will stem the bleeding; when from the nares, the hemorrhage may be stemmed by plugging up the anterior and posterior apertures of the nostrils with lint. Hemorrhage proves sometimes fatal in rapid ulceration involving large arteries.

The greater number of animals have veins, at least all those which possess a heart: veins, therefore, are only observed to be deficient in insects, as the erucæ, and in zoophytes, as the polypi. Veins are also sometimes found deficient in the human monster, when born without the heart.

In page 177 we remarked, that the capillary, and even some of the larger arteries, terminated in, or joined the veins; that this junction can be demonstrated on the pia mater of the human brain, the tail of a fish, the web-foot of the frog, and the gills of the salamander and frog; and that this inosculation had been witnessed not only in these animals, but in others, by several physiologists, as Harvey, Lewenhoeck, Bernouilli, Cowper, Malpighi, Hales, Haller, and Spallanzani. When cleaning out the arteries of a limb, or the head of a subject, with tepid water, previous to injecting it with coloured wax, the water returns by the veins; and when injecting the arteries of a limb, or the head, with the coloured wax, the veins are often found filled. If a ligature be applied to a vein, or if pressure be made, as in blood-letting, the distal parts become turgid, while the proximal, or those next the heart, are found empty; so that there can be no doubt, that the veins return the blood from the arteries to the heart, and that they circulate their blood from extremes, or branches, to trunks: this latter observation is applicable to all the veins, with the exception of the vena portæ, which when it approaches the liver, branches from a trunk like the arteries. That some veins commence by open mouths, and perform the function of absorbents, is still doubtful; for although there are many experiments related by Haller, Magendie, and others, which seem to substantiate this opinion, yet they can all be satisfactorily explained by the acknowledged fact, that the veins and lym-

phatics have a direct communication. Where the veins have been found to be absorbents, they may have received the fluid through the medium of the lymphatics, either in the living, or in making mercurial preparations in the dead state.

The veins begin by small branches continuous with the arteries, and have numerous inosculations as they advance and become larger, even in their largest trunks. The veins of the lower extremities and abdomen form the vena cava ascendens, which enters the right auricle, along with the vena cava descendens and the coronary vein, the former of which returns the blood from the head and upper extremities, while the latter returns it from the heart. The anastomoses of the veins differ from those of the arteries, the former taking place even in the larger trunks, the latter only in their smaller branches; and by the blood thus concentrating in the veins, it flows with more rapidity.

The veins take various courses; some accompany the arteries, as the venæ satellites of the arteries of the extremities; others run between the skin and the muscles, as the cutaneous of the extremities; others abandon the arteries, the blood of which they return, as the sinuses of the brain: others again form several separate plexuses, without accompanying the arteries, as those of the neck, tonsils, spermatic cord, urinary bladder, and vagina. The veins vary in the thickness of their sides, those running immediately under the skin being the thickest, while those in the abdomen are the thinnest, with the exception of those in the sinuses of the head. This variety of thickness seems to depend on the pressure applied to the veins, those vessels being thickest where little or no pressure exists, as the subcutaneous. The veins, like the arteries, have three tunics, but considerably thinner, namely, a cellular, a muscular, and a serous; the first and last, like the

arteries, are allowed by all, but the middle or muscular is doubted, and particularly its muscular contractility; flexile muscular fibres, however, can be demonstrated running longitudinally on the venæ cavæ in man, and many other animals, which fact is taken notice of by Lancisius, Borelli, Senac, and Haller; the last of whom observed these vessels pulsate and contract in propelling the blood into the right auricle, both in cold and warm-blooded animals, which latter circumstance was also noticed by Lancisius, Senac, Steno, Lower, Cowper, and a number of anatomists. The fact that the blood circulates in worms of red blood, that have no heart, and that the umbilical vein of the fetus, both in the perfect fetus and in the monster without a heart, circulates its blood, satisfactorily prove that veins possess muscular contractility. They have nerves, lymphatics, arteries, and veins, the same as the arteries. The veins have no adscititious cellular covering, or circular muscular fibres, and although much thinner, yet they have greater density and strength than the arteries, being sometimes prodigiously dilated with blood, and afterwards returning to their wonted calibre. In the dead state, they are less easily ruptured by the distention of injections than the arteries. In old animals, however, the veins have less density and specific gravity than the arteries. In some parts of the body, as in the sinuses of the brain and in the bones, the veins consist only of their internal or serous tunic.

When a vein is opened, we observe the blood flow in jets, shewing that the impulse of the heart is even communicated, to a certain extent, in the venous system. Hales and Walæus observed the blood accelerated in the capillary veins, at each systole of the heart, in cold-blooded animals; but Haller found that this did not take place in warm-blooded animals. The increased flow of

the blood into the veins appears consequent on the action of the heart, communicated through the medium of the column of blood in the arteries; but the blood is moved forwards in the veins, partly by the action of the heart, partly by the elastic and muscular powers of the arteries, and partly also by similar powers in the veins. These powers of elasticity and muscular contractility are much feebler in the veins than in the arteries, in consequence of their more delicate structure.

As certain portions of the body tend to induce congestion in the veins, as the action of the muscles in the extremities, Nature has, with her infinite wisdom, placed a number of valves in these vessels, and these are consequently found most numerous in the veins of the extremities. Valves exist also in the veins of the neck and head, but they are deficient in the brain, those in the sinuses having merely little productions of the membrane stretching across; and they are also deficient in the vertebral veins, in the pulmonary veins, in the coronary vein of the heart, with the exception of a single valve at the termination of the latter in the viscus, in the veins of the portal system, in those of the urinary bladder, in those of the uterus, in those of the kidneys or supra-venal glands, in the placenta, or umbilical vein, though the latter has some rugæ. These valves, which are of a sigmoid shape, as represented in *Fig.* 3, Plate III. Part II., vary from one to three in number, one being only found in the smaller, as in the veins of the hand, foot, spermatic cord, and vena azygos, and one at the termination of the vena cava inferior, named after Eustachius, and one at the coronary vein. Two valves are found in the majority of the veins, and three where the larger veins unite, as at the junction of the crural veins, and that of the internal jugular with the subclavian vein. These valves are formed by a pro-

duction of the internal or serous tunic, and have a shining and somewhat tendinous appearance, that portion adhering to the wall of the vein being in some degree callous; and they have their free edges pointing to the heart, or proximad. They seldom form a complete partition, but oppose a considerable obstacle to the reflux of the blood.

The valves of veins seem to be designed to obviate pressure, and hence they are found in the veins of the extremities, and in those returning the blood from the testis and ovarium. These valves consequently prevent muscular contraction from retarding the flow of the blood, and by their directing the course of this fluid, the muscles rather increase than diminish, by their motions, the velocity of the blood. These valves evidently answer the same purpose in the subcutaneous veins, for there they are constantly exposed to the pressure of the skin. The blood is propelled in the veins of the mesentery, &c. by the action of the abdominal muscles, and in the lungs by the motion of respiration, hence no valves are requisite in these regions. Veins have their vasa vasorum and nervous twigs like arteries, and are much more sensitive. In some places the veins are more dilated than in others, as in the vena cava inferior sacrad to the diaphragm, the beginning of the internal jugular, and the popliteal vein between the condyles of the os femoris.

The blood is found to flow faster in the trunks than in the branches of the veins, which must depend partly on a law of hydraulicks, that a fluid flowing from a larger into a smaller tube, is augmented in velocity, and partly on the principle that it flows in larger vessels possessing stronger muscular fibres. Hence, when a small vein is opened, the blood flows very slowly, but more quickly from a larger vein, and with still more rapidity from a

venous trunk. The flow of the blood in the veins is observed to be more rapid the greater the number of uniting branches, and the shorter these are, because they are less tortuous. The less veins anastomose, and the less the angle at which they meet in anastomosing, the more is venous congestion prevented: but these anastomoses of veins enable the blood, when impeded in one course, to flow by another onwards to the heart.

The blood in the veins flows quicker, the more rapidly the arterial blood flows; and it is agreed, that in vessels of the same size, the blood flows slower in a vein than in an artery, in consequence of the propelling powers being diminished by the friction of the blood against the sides of the vessels, and its adhesion to these sides; and also, in consequence of the feebler structure of the veins.

Veins are not only greater in diameter, but thrice as numerous, as the arteries; the area of the whole venous system is found much greater than that of the arterial; that of the veins is calculated to be to that of the arteries, as nine to four, which is easily comprehended by the great number of middle-sized veins, and by the excess of veins over the arteries, as, for example, in the upper extremity. Much greater variety occurs both in the division and in the origin of the branches of the veins than in the arteries.

When the body is exposed to caloric, the blood passes readily into the veins, apparently from the expansion of the capillaries, and the increased impetus given to the circulation of the heart; on the contrary, when exposed to cold, the capillary vessels are contracted, and the blood circulates more slowly.

When a ligature is thrown round a vein, its coats are merely applied to each other; they are not ruptured, like those of an artery, consequently more irritation is produced, and inflammation excited: and as the action or mo-

tion of veins is the reverse of that of arteries, being from extreme branches to the heart, and the blood flowing in the same direction, the inflammatory action frequently extends to the heart and proves fatal. It is now therefore an axiom in operative surgery, never to apply a ligature to a vein, even in amputation, but to trust to compression. Dry sponge, with proper bandaging, is found capable of stemming the hemorrhage from the largest veins.*

If a fine or thin ligature be employed, the internal tunic is lacerated, inflammation produced, and if compression be applied, so as to retain the opposite sides of the vein in contact, adhesion takes place.

Veins are very prone to inflammation from wounds, as in blood-letting, particularly where there is any tendency to erysipelas, and in sultry weather, and especially in crowded and filthy hospitals. The inflammatory action extends along the vein onwards to the heart, and very frequently proves fatal. The vein, where punctured, is thickened in its coats, and for some extent onwards towards the heart; in some places the internal tunic is of a deep red colour, onwards to the right auricle; in other places it is lined with coagulable lymph, and in others again with pus. The vein is frequently found obliterated in places. The cellular substance in the contiguity of the vein is often in-

* There are numerous cases on record of the fatal effects of tying veins; in Travers' Surgical Essays, Part I.; Carmichael, in Transactions of the Association of Fellows of the King and Queen's College of Physicians in Ireland, vol. ii.; Abernethy's Works; Loguet, Dissertation sur l'Inflammation des Veines, Paris, 1815; Hodgson on Diseases of Arteries and Veins; Hunter, in Transactions for Improvement of Medical and Surgical Knowledge, vol. i.; Breschet, Traité des Maladies des Artères et des Veines; Surgical Essays by Sir Astley Cooper and Travers. Meckel and Osiander detail cases where the tying the umbilical cord proved fatal. The same event I have witnessed myself, where the inflammation and suppuration extended onwards to the liver of the child.

filtrated with pus, so also occasionally is the pectoral muscle. The symptoms of this disease are pain in the wounded part, extending along the extremity with great tumefaction, severe pyrexia, small quick pulse, hot skin, difficult respiration, furred tongue, great prostration of strength, with pain in the head, back, and extremities. The treatment consists in active blood-letting from the system, warm bath, laxatives, low diet, and rest, accompanied with leeches, hot anodyne fomentations and poultices applied to the arm. Abscesses often occur in the course of the vein, and require to be early punctured.

The crural veins have occasionally been found inflamed and filled with purulent matter, after accouchement; and the hypogastric and spermatic veins, onwards to the renal veins, have been found in the same state in puerperal fever, and after abortion.* One or more veins in the body have been found in a similar condition in phthisis pulmonalis, in cancerous states of various organs, and in erysipelas.† Veins have been found inflamed from metastasis.‡

Ulceration occasionally begins in the interior coat of a vein, and ulcerates through the vessel, so as to give rise to hemorrhage.§ Veins have been found ruptured without ulceration, or any morbid change, being easily torn when suddenly distended, as in cramps,‖ sudden action of the circulating system, as in the cold bath,¶ in the cold

* Faits pour servir à l'Histoire des Inflammations Veineuses et Arterielles, Biblioth. Médic. tome xvi. Schwilgué; Medico-Chir. Trans. vol. iii., Travers and Wilson; Clarke's Practical Essays on the Management of Pregnancy.

† Breschet, Traité des Maladies des Artères et des Veines.

‡ Ibidem.

§ Portal, Anatomie Médicale, tome iii.

‖ Hodgson on Diseases of the Arteries and Veins.

¶ Portal, Anatomie Médicale, tome iii.

state of intermittent fever,* and from blows, an instance of which I witnessed in the thigh of a man, who received a blow from a hammer, where the branches of the vein accompanying the arteria profunda femoris were ruptured. When slowly dilated, however, veins bear distention better than the arteries.

The veins are liable to be deranged in their functions from pressure, and from gravity; and those of the lower extremities, as also those returning the blood from the testicles and ovaria, seem most subject to be disturbed from such causes. When they become enlarged and tortuous, they are named varicose. The hemorrhoidal veins are also frequently varicose; likewise the superficial epigastric, and those at the bend of the arm, have been found in this state.†

Morgagni observed the jugular veins dilated,‡ and Portal the right subclavian vein dilated.§ The femoral vein immediately distad to Paupart's ligament has been found so dilated, as to be mistaken for hernia. Sometimes coagula of blood are deposited in varicose veins, and were formerly extracted by surgeons;‖ but this practice, from its frequently producing violent constitutional irritation, is now abandoned; and for the same reason, the tying of veins with ligature is abandoned.

Pain and inflammation of the skin and cellular membrane frequently accompany dilatation of veins, the inflammation terminating either in abscesses or indolent ulcers around the veins. When the hemorrhoidal veins

* Portal, Anatomie Médicale, tome iii.

† Petit, Traite des Maladies Chir. tome ii.; Hodgson's Treatise on the Diseases of the Arteries and Veins.

‡ Letter xviii. Art. 9, 10, 11.

§ Cours d'Anat. Med. tome iii.

‖ Petit, Traité des Mal. Chir. tome ii.

are varicose, they are named hemorrhoids, or piles; and besides being varicose, they frequently rupture and effuse their blood into the cellular substance; which last state, I am disposed to think, is that in which we find them when we apply the term hemorrhoids; for in a multiplicity of instances which I have examined after death, I have invariably found those tumours around the anus, consisting of effused coagulated venous blood, in the loose cellular web of that region; while the veins of the rectum leading to these tumours, were enlarged and tortuous. In life they should be freely laid open with a lancet, and afterwards poulticed till free of pain; then anointed with the ointment of nut-galls, or bathed with the decoction of oak-bark, and lastly discussed with the rectum bougie, introduced at bed-time, and left to remain as long as possible. When touched with the lancet, if they bleed much, a piece of dry sponge, and the T bandage, or a couple of handkerchiefs applied after it, will be found to suppress it. Those of the spermatic cord in man are very frequently so affected, and begin sometimes very early in life. The female, in the advanced stages of gestation, is most subject to those of the leg; however, women unimpregnated are even affected: men are also occasionally affected with varicose veins of the legs, being consequent on collections of feces in the intestines, and tumours of the abdomen or pelvis. This varicose state sometimes arises in consequence of the circulation of the vein being obstructed, and even obliterated. In some instances, the vein ruptures, and hemorrhage takes place; an occurrence by no means uncommon in the saphena major of the leg. In the varicose state of the legs, bandaging and attention to the bowels generally dissipates them. A strong decoction of oak-bark is a powerful auxiliary. In varix of the spermatic cord, the application of oak-bark decoction is

still more indispensable, as no bandage can be applied; the whole veins of the scrotum, as also those of the spermatic cords, are occasionally affected. The suspension of the testes by a bandage, and attention to the bowels, are requisite, together with the frequent application of cold water, and lying the greater portion of the twenty-four hours in the horizontal posture.

Varicose aneurism* is that species which is produced by a lancet, or any sharp-pointed instrument, transfixing a vein, and wounding an artery in its immediate vicinity, so as to establish a communication between them, and allow the arterial blood to flow directly into the vein. Inflammation is excited at the wounded points of the vein, fascia of the biceps and the artery, so as to form a bond of adhesion between them, and a passage for the blood; for it sometimes happens, that the wound in the artery does not adhere to that of the fascia, and the blood escapes beneath the latter, and is diffused into the cellular substance, forming false aneurism. A tumour is soon formed of a bluish colour, which communicates a tremulous motion and rustling noise to the touch and hearing; and the veins in the contiguity are more or less varicose. This species of aneurism occurs most frequently at the bend of the arm, but has been known to occur between the subclavian artery and vein, the popliteal artery and vein, and the femoral artery and vein. This species is treated by compress and bandage, and if these fail to accomplish a cure, by securing the artery by operation. See Parts II. and III.

Aneurism by anastomosis, first correctly and properly described by my able preceptor, the late Mr. John Bell, is that species where the small arteries and veins are so

* Syn. Aneurismal varix.

numerously collected at any part of the body, as to present a peculiar vascular appearance. This species is first the simple nævus maternus, when the blood-vessels are generally so small, as not to prove troublesome or serious. These, however, as the individual advances in life, increase in calibre, rupture in sultry weather, or in intense cold, producing hemorrhage, which each time becomes more momentous, until at last it proves fatal. This is particularly the case when it attacks a surface delicately covered with integuments, as the lips. In one or two cases of children, I have witnessed this disease involve the chest, neck, mouth, fauces, and pharynx. This disease sometimes follows an accident. Mr. J. Bell mentions that there are intermediate cells between the arteries and veins, which may be the structure in those cases depending on accidental violence; but in those I have had an opportunity of examining, and which appeared to be consequent on congenital marks, there was no cellular intervention. The veins in some instances have been found to form the greater portion of the tumour.

Aneurism by anastomosis, when insulated, may be removed by operation, by extirpating the vessels and structure in the neighbourhood, and securing the arteries leading to it. The simple securing of the arteries leading to this vascular body, has been found ineffectual; while in the early stage of the disease, pressure and cold applications have proved efficacious.

Veins are very seldom converted into cartilage, or ossified, or covered with calcareous depositions; cases, however, are recorded by Morgagni,* Baillie,† Macartney,

* Morgagni, Letter lxiv. Art. 9.

† Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. i.

Hodgson,* Beclard, Breschet,† and other authors. Loose calculi have also been found in veins;‡ and tumours, resembling in appearance those in the contiguity, have been found growing from the lining coat of veins.§ There are several instances on record of large veins being obliterated, as the vena cava inferior, and the circulation carried on by the vena azygos.‖ I met with a preparation in the dissecting-room, where no trace of the vena cava inferior was to be found, and where the vena azygos carried on the circulation. Veins, like arteries, are frequently involved in inflammation, ulceration, mortification, &c. of contiguous structures.

The chemical composition of the blood, and the theory of respiration, with the diseases of the lungs, will be given in a subsequent Part.

* Hodgson on Diseases of the Arteries and Veins.

† Breschet, Traité des Maladies des Artères et des Veines.

‡ Ibid., and Hodgson on Diseases of the Arteries and Veins.

§ Ibid.

‖ Bartholinus Observat. Anat. Cent. ii. Hist. xxxv.; Haller, Opuscula Path. Obs. xxx.; Transactions of a Society for the Improvement of Med. and Chir. Knowledge, vol. i. p. 127, and vol. iii. p. 70; Scarpa on Aneurism, Wishart's Translation, p. 20, note.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART IV.—THE MUSCLES OF THE TRUNK.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, LONDON; AND

HODGES AND M'ARTHUR, DUBLIN.

1824.

EDINBURGH:
Printed by John Brewster.
11, Society.

TO

DR. DUNCAN,

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS,

PROFESSOR OF MATERIA MEDICA IN THE UNIVERSITY OF EDINBURGH,

&c. &c. &c.

THIS PART IS DEDICATED,

IN

ADMIRATION OF THAT PROFOUND RESEARCH IN MEDICAL LORE,

AND

SOUND VIEWS OF PATHOLOGY,

THAT HAVE EXALTED HIM TO THE

DISTINGUISHED RANK OF CONSULTING PHYSICIAN AT HOME,

AND

WHICH HAVE EXTENDED HIS FAME ABROAD;

ALSO,

AS A TRIBUTE OF GRATITUDE

FOR HIS KIND ATTENTION AND CONTINUED FRIENDSHIP

TO

HIS TRULY OBLIGED SERVANT,

THE AUTHOR.

PART IV.

THE MUSCLES OF THE TRUNK.

PREFACE.

THE Author, in presenting this Part to the Public, feels highly gratified by the favourable reception of the preceding Numbers, and returns his warmest acknowledgements to the members of the medical profession of London, Dublin, Glasgow, and Edinburgh, for the interest they have taken in the Work; but in a particular manner, to Sir Astley Cooper of London, and Mr. Burns of Glasgow, for their valuable observations on this part of the Muscles in their relation to hernia. The Author also returns his sincere thanks to the Editors of the different periodical works, who have taken so flattering notice of the publication.

When Part II. was published in the early part of the session, the Author took occasion to express his sorrow for the degraded state of his profession,

and the threatened ruin of the Medical School of his native place, owing to the scarcity of *subjects*; and for doing this, he has incurred considerable censure: deeply does he regret, that he has yet found no reason to alter his opinion, for the winter session is now near its conclusion, and he candidly declares, that such has been the scarcity of *material*, that no teacher of anatomy or surgery has been able, either to follow the regular plan of his course, or to do his duty to his pupils; the consequence of which has been, that many of the Students have left the school in disgust, and gone either to Dublin or Paris, while a still greater number, deprived of the means of dissecting, have contented themselves with lectures on theories and with grinding, and entered on the practice of their profession ignorant of its fundamental principles. Seeing, then, that our fellow-creatures are daily tortured by the ignorant or the half instructed, that bone-setters are more consulted than surgeons, quacks than physicians, who, that is interested in the success of his profession, in the prosperity of his native place, and in the welfare of mankind in general, ought to shrink from attempting, at least to point out, if he cannot arrest such calamities?

The destruction of this Medical School can only be prevented by the timely interposition of the patrons who have ample means in their power, and can surely do, what their forefathers did a century before them.* The desertion of Students of Medicine for some years past has been such, that it is impossible any longer to mince this matter: the Medical School has been the theme of discussion both at home and abroad; and the Surgery of this place has been hitherto held up to derision, so that there remains no other means of retrieving our character, but by instantly rectifying the great master evil. Let this School have *material*, and it will soon revive, and speedily eclipse those of Paris, London, and Dublin. Deprive it of *material*, and a few years will irretrievably sink it into oblivion, in despite of all the celebrity, and all the exertions of professors and teachers.† A blind infatuation prevents some

* In the Council Register for 1694, and the years following, it is recorded that all unclaimed dead bodies in the charitable institutions, or in the streets, were given for dissection to the College of Surgeons, to one or two of its individual members, and to the Professor of Anatomy. All the medical schools of the Continent are openly and publicly supplied with *subjects* who have died friendless in the public charities.

† The College of Surgeons of Edinburgh sent last year to Paris one of their members, with a salary of L. 300 per annum, who was empowered to expend L. 500 in anatomical preparations: this gentleman, however, has been obliged to return, in consequence of the jealousy of our Parisian brethren.

from observing this crisis; they imagine the fame of the School and its Professors will support it for ever, not considering, that where there is no seed, there can be no fruit. Let a Student have the acids, alkalis, earths, metals, and mineral compounds, with a chemical apparatus and a System of Chemistry; let him explore the mountains and valleys with a Flora Scotica; let him have *subjects*, with a work on Practical Anatomy; let him have the various medicines, with the Dispensatory; and let him walk the Cowgate and Canongate for patients, with a System of the Practice of Physic and Surgery; and I predict, that he will become a Physician or Surgeon, as superior to those educated by the present system of teaching at this School, as Monro Secundus and John Hunter* were to the quacks of their day.

The Author has to apologize, that the Physiological and Pathological Observations on the Arteries and Nerves, have not yet been published; he trusts, however, his various avocations arising from practice,

* Monro Secundus was educated by his father in the dissecting-room, when *subjects* were obtained from the public charities, and who that remembers the extraordinary talents of this profound physician and surgeon, does not lament his loss to this city? The celebrated John Hunter, equally gifted as a philosopher and a surgeon, studied in the dissecting-room under his brother in London.

teaching, and making the dissections and drawings of the Muscles, will be considered an ample apology by his indulgent readers. As his labours in teaching will terminate for a time, at the end of the Session, he pledges himself to give the Physiology and Pathology of the Nervous and Arterial systems during the ensuing summer: these are already prepared, but require arrangement and condensation before publication. The Observations on the Muscles will be given when the Parts illustrative of them are published, at which time the Author will classify the Muscles, and present a tabular view of them, which he has been prevented doing, in consequence of not having been able to display all the Muscles in this Number. He has divided the Muscles into those of the trunk, those of the upper extremity, those of the lower extremity, and those of the head, so as if possible to make them distinct subjects. Those who wish to make themselves more minutely acquainted with the attachments of the Muscles, may consult Part I. as they proceed; and this the Author earnestly recommends to the junior Anatomists, that they may acquire a perfect knowledge both of the Muscles and of the Bones.

CONTENTS.

External Oblique Muscle, (Pl. I. II. III. V. letters F, f,) - 1
Internal Oblique Muscle, (Pl. II. III. V. letters G, g, *g*.) - 6
Transversalis Muscle, (Pl. III. letters I, i,) - - - 7
Rectus Abdominis Muscle, (Pl. I. II. letters R, r,) - 10
Pyramidalis Muscle, (Pl. I. T,) - - - - 11
External Intercostal Muscles, (Pl. II. VI. letters Z,) - 12
Levator Muscles of the Ribs, (Pl. VI. letters Z,) - 13
Internal Intercostal Muscles, (Pl. II. III., letters X,) - 13
Sterno-Costalis Muscle, (Part II., Pl. III., fig. 2, letters B,) 14
Diaphragm, (Pl. IV. letters B, b,) - - - 15
Trapezius Muscle, (Pl. V. digits 80,) - - - 17
Latissimus Dorsi Muscle, (Pl. V. letters E in lower half of back,) - - - - - - 19
Rhomboideus Muscle, (Pl. V. VI. letters T, t,) - - 21
Serratus Posticus Inferior Muscle, (Pl. V. H,) - - 22
Levator Scapulæ Muscle, (Pl. V. VI. digits 40, and in Part II. Pl. VII. digits 40,) - - - - 23
Serratus Posticus Superior Muscle, (Pl. VI. E,) - - 23
Splenius Capitis et Colli Muscle, (Pl. V. VI. letters p, *p*,) 24
Sacro-lumbalis Muscle, (Pl. VI. V. VII. letters D, d,) - 25
Longissimus Dorsi Muscle, (Pl. VI. V. VII. letters K, k,) 27
Spinalis Dorsi Muscle, (Pl. VI. L,) - - - 27
Semi-spinalis Dorsi Muscle, (Pl. VII. VI. M,) - - 28
Semi-spinalis Colli Muscle, (Pl. VII. N,) - - 28
Multifidus Spinæ Muscle, (Pl. VI. Q,) - - - 29
Quadratus Lumborum, (Pl. VI. C., Part II., Pl. V. C,) - 30
Cervicalis Descendens Muscle, (Pl. VII. VI. D,) - 31
Transversalis Colli Muscle, (Pl. VII. VI. k,) - - 31
Trachelo-Mastoideus Muscle, (Pl. VII. F,) - - 32
Complexus Muscle, (Pl. VII. O,) - - - 32
Obliquus Capitis Superior Muscle, (Pl. VII. B,) - - 33
Obliquus Capitis Inferior Muscle, (Pl. VII. E,) - - 34
Rectus Capitis Posticus Major Muscle, (Pl. VII. A,) - 34
Rectus Capitis Posticus Minor Muscle, (Pl. VII. P.) - 35
Rectus Capitis Lateralis Muscle, (Pl. VII. H,) - - 35
Interspinales Muscles, (Pl. VII. V. letters g,) - - 35
Intertransversalis Muscle, (Pl. VI. letters *h*,) - - 35

Fascia Superficialis, - - - -	1
Gimbernat's Ligament, - - - -	4
Operation for strangulated Femoral Hernia, - -	4
Fascia Lumborum, - - - -	6
Anatomy of Inguinal Hernia, - - -	9
Operation for strangulated Inguinal Hernia, - -	9
Operation for Ascites, - - - -	10
Operation for securing Abdominal Aorta, Cæsarian Section, and extirpation of Tumours in Abdomen, Part II., page 25, and Part IV. - - -	11
Ligamentum Nuchæ, - - - -	18
Intertransverse Ligaments, - - -	36
Internal Ligament of Neck of Rib, - - -	36
Capsular Ligament of Tubercle of Rib, - -	37

THE

MUSCLES OF THE ABDOMEN.

PLATES I. II. III.

In Plate I., on the left side of the subject, the integuments and the fascia superficialis* are removed; while on the right side, the conjoint tendons of the external and internal oblique muscles are cut open, to bring into view the rectus abdominis R and pyramidalis T muscles.

The musculus obliquus externus abdominis,† marked

* The fascia superficialis is merely the condensed cellular membrane between the skin and the external oblique muscle, and should not be taken into consideration by the operator in strangulated hernia, since in nine cases out of ten it is so thin as not to be perceptible. In one case of strangulated congenital inguinal hernia, where the patient was upwards of thirty years of age, and on whom I operated, I expected to find this fascia thickened and distinct, but no vestige of it was to be seen. For further information on this subject, consult Monro's Observations on Crural Hernia. The fascia superficialis is supposed to direct the viscera protruding at the crural aperture, upwards or atlantad on the external oblique muscle; but this opinion is incorrect, as the fascia adheres to Paupart's ligament, and is therefore superior or atlantad to the crural aperture, and consequently must prevent rather than facilitate the ascent of the tumour. The reason of the viscera ascending, appears in consequence of the smallness of the aperture, the unyielding nature of the ligaments forming the foramen, and the manner in which the small intestines are bridled to the mesentery.

† Syn. Oblique descendens; obliquus descendens; obliquus externus; obliquus descendens seu exterior; obliquus descendens externus; obliquus major; grand oblique abdominal; ilio-pubi-costo-abdominal; costo-abdominal.

with the letters F, f, and situated in the lateral and anterior aspects of the abdominal cavity, is rather a thin, than a thick fleshy muscle in its carneous portion, and has a delicate tendinous expanse superiorly or atlantad, but a strong and dense one inferiorly or sacrad, in its tendinous portion. This muscle derives its origin from the seven or eight inferior ribs near their cartilages, by the same number of fleshy slips, marked with the letters F, which are at first tendinous, and intermingle with the pectoralis major muscle C, with the digitations of the serratus magnus muscle, letters O, with those of the latissimus dorsi muscle, letters E, and with the external intercostal muscles situated beneath, as seen in Plate II., marked with the letters Z. These fleshy fibres diverge and descend obliquely forwards or mesiad, and downwards or sacrad, till they arrive at the outer or lateral margin of the rectus muscle R, r; where becoming tendinous, they are marked f, and continue their course over or superficially to the latter muscle, and uniting with the expansive tendon of the internal oblique, marked with the letters g, Plate II., proceed onwards to the central or mesial line, letters *f*, of the abdomen, where they interlace with the tendinous fibres of the external oblique and the other two lateral muscles of the opposite side, forming what is named the linea alba, *f*. At the crista of the os pubis, the tendinous fibres cross those of the opposite muscle, to be inserted into the os pubis of the right side; while the fibres of this part are also inserted strongly into the crista, and particularly into the spine of the os pubis of the left side. From this point outwards or iliad, the tendinous fibres n are observed to be intimately connected with the iliac portion of the fascia lata K, and still further iliad to be inserted, partly tendinous, and partly fleshy, into the crista s of the os ilium, occupying its two anterior or sternal

thirds; the last portion of the muscle descends nearly in a perpendicular line.

The superior digitation is remarkably delicate both in its carneous and tendinous portions, and is very liable to be removed by the dissector, unless he proceeds with caution; the tendinous fibres are connected with the ensiform cartilage, and interlaced with those of the pectoralis major of the opposite side; and they are so translucent, that the fibres of the rectus muscle shine through. As the digitations descend to the last rib, both the carneous and tendinous portions become thicker. They are irregular in number; sometimes there are seven digitations, sometimes eight or even nine, and this last occasionally takes its origin from the transverse process of the first lumbar vertebra; the ninth, however, is sometimes the first digitation, deriving its origin from the fourth rib. These digitations are occasionally cleft in two. Where the fleshy fibres become tendinous at the lateral margin of the rectus muscle, they contribute to form what is named the linea semilunaris, marked with the letters f, which is merely the white line of this shape, formed by the three lateral muscles of the abdomen on becoming tendinous at this margin of the rectus muscle. Nearly in the centre of the linea alba, is observed the umbilicus u, an aperture that transmitted in the fetus the umbilical cord, which is seen in Part II., Plate II., *Fig.* 6, marked g, *n*, *n*; here the tendinous fibres cross each other, so as to compress the umbilical cord after birth, and prevent not only hemorrhage, but also shut up the aperture in after life, and prevent umbilical hernia from occurring. Near the pubes another aperture is observable, named the external of the inguinal canal, which in the female transmits the round ligament of the uterus, see Part II., Plates I. and V, letters *l*; and in the male the spermatic cord, see

Part III., Plates XIV. letters g, XV. letters a, x, XVI. letters g, and in this Plate marked a. Here the tendinous fibres separate into two portions, a superior and an inferior, the superior, marked 1, assumes the name of the upper pillar; and the inferior, marked 2, the name of the lower pillar, of the external aperture of the inguinal canal. This foramen is beautifully strengthened by transverse tendinous fibres, which prevent the frequent occurrence of rupture.* These lower fibres are seen in Plate II., marked with the digit 3, to be inserted not only into the spine of the os pubis, but into the linea-ilio-pectinea contiguous, and into the pubic portion D of the fascia lata, and are improperly designated a ligament, which is named after Gimbernat.†

* The rupture which takes place at this aperture either in the male or female is named inguinal; and when the viscera descend in the male into the scrotum, it is termed scrotal hernia.

† The situation and shape of this portion should be considered in relation to femoral hernia, for the iliac margin forms more than two-thirds of the femoral or crural aperture through which the viscera protrude in this disease. This foramen will be more clearly defined in Part V. When the viscera become strangulated at this aperture, the division of Gimbernat's ligament 3, Plate II., affords more relaxation, and is safer than the division of any other tendon or ligament. In the performance of this, a probe-pointed straight bistoury should be introduced between the viscera and ligament, with the back of the knife to the former, and the cutting edge to the latter or ligament, and carried horizontally towards the os pubis. The bistoury should be introduced to the least possible extent, in order to guard against wounding the obturator artery, when this vessel is a branch of the epigastric, a circumstance equally as common as it is a branch of the internal iliac. Here the operator must be aware that the herniary or peritoneal sac is divided at the same time with this ligament. When the division is accomplished, the limb of the affected side of the patient should be brought near the abdomen, and the knee turned inwards or tibiad; and the trunk ought to be bent on the limbs, so as to relax the tendon of the external oblique, and the fascia lata. The same directions as to the position of the limb and trunk are to be observed before an operation is performed: in either case, the viscera should be pushed directly into the abdomen, being careful to return that portion first which was the last in protruding. In the taxis, the tumour must be pressed first downwards or centrad, then upwards or atlantad, so as

Where the fibres are inserted into the symphysis pubis, they give origin to tendinous fibres, that form the suspensory ligament of the penis, marked 70, seen also in Part III., Plate XV. Where the tendinous fibres, marked B, are inserted into or incorporated with the iliac portion K of the fascia lata, they are* absurdly named Fallopius or Paupart's ligament. Where the posterior fibres descend from the last rib to the crista of the os ilium, they are overlapped by the latissimus dorsi muscle E, as distinctly seen in Plate V. Throughout the tendinous expanse of the muscle, fissures or apertures are observable, which in some instances permit the viscera of the abdomen to protrude and form ventral rupture.

The external oblique muscle is concerned in the functions of respiration and digestion, in propelling the food onwards in the intestinal canal, in the expulsion of the feces and urine, in the propulsion of the fetus in parturition; and also in inverted functions, as in vomiting. When the thorax is a fixed point, and when one muscle acts, the pelvis will be elevated obliquely upwards; and when both muscles act, they will pull the pelvis directly upwards. When the pelvis becomes fixed, both muscles will bend

to push the intestine around and beneath Paupart's ligament. When an operation is performed, the division of Gimbernat's ligament is sometimes inadequate to the magnitude of the viscera protruded, in which case the ligament of Paupart must be divided directly upwards, which I have had occasion more than once to do; but in doing this, great attention must be paid not to introduce the bistoury too far into the abdomen. The viscera sometimes descend in the cellular sheath of the crural vessels.

* I have applied such an epithet to this ligament, as there is nothing more than the condensed tendinous fibres of the external oblique muscle, which are influenced in every motion of this muscle, and in every motion of the anterior part of the thigh; and because the nature of a ligament is liable to mislead the practitioner in the operation of the taxis in strangulated hernia, or in that of reduction after the stricture has been laid open.

the thorax downwards as in stooping; and when only the one muscle acts, it will inflect the thorax obliquely downwards. Besides these general motions, each digitation may be thrown into action, and the inferior portion of the tendon will produce tenseness in the fascia lata.

In Plate II., the external oblique muscle of the left side is removed, excepting where its tendon f, is incorporated with the tendon, letters g, of the internal oblique muscle G, and where its tendon assumes the name of Gimbernat's ligament 3. On the right side, the pyramidalis muscle is removed, and the rectus muscle R nearly all detached.

The musculus obliquus internus abdominis of the left side G, g, g, g, * is situated in the lateral and anterior aspects of the abdomen, derives its origin fleshy from that portion of the tendon of the external oblique which is attached to the iliac portion K of the fascia lata, or rather from the junction or angle formed by both ;† tendinous and fleshy, from the crista s of the os ilium; and tendinous from the fascia lumborum, as seen in Plate V., ‡ or from the transverse processes of the lumbar vertebræ. The fibres radiating from this extent of origin upwards, forwards, and downwards, are inserted fleshy into the three lowest, and tendinous into the four contiguous ribs, letters A; the whole of the muscle becoming tendinous at the linea semilunaris,

* Syn. Oblique adscendens; obliquus ascendens; obliquus internus; obliquus ascendens internus abdominis; obliquus alter seu interior; obliquus minor; ilio-lumbo-costi-abdominal; ilio-abdominal; petit oblique abdominal.

† In the drawing this muscle appears to arise solely from the iliac portion K of the fascia lata, the whole of the tendon of the external oblique having been detached, to shew there is no distinct ligament as Fallopius or Paupart's.

‡ The fascia lumborum is the united tendons of the latissimus dorsi E, the serratus posticus inferior H, the internal oblique G, and the transversalis abdominis muscles, as seen in Plate V.

letters g, divides into two expansive layers, which enveloping the rectus muscle R, advance onwards to join the muscles of the opposite side, so as to assist in the formation of the linea alba, letters *f*. On this left side, the anterior or superficial tendinous layer, letters g, is observed to be incorporated with the tendon f of the external oblique muscle; while on the right side, the posterior or deep tendinous layer, letters *g*, is seen incorporated with the transversalis muscle from the ribs downwards, or sacrad to the umbilicus U; but more sacrad, there is merely the peritoneum *a*, behind the rectus muscle R; this posterior layer of the internal oblique running anterior to the rectus muscle. At the pubes, in Plate III., both layers are united, and strongly inserted along with the transversalis muscle i into the crista, the spine *s*, and the linea-ilio-pectinea *p* contiguous. The internal oblique, a little iliad, gives origin to the cremaster muscle a, as delineated on the left side in Plates II. and III., which latter muscles surrounding the spermatic cord, emerges at the external aperture of the inguinal canal, as represented in Plate I., and descends to the tunica vaginalis testis b, as seen in Part III., Plate XV. Near the tenth or eleventh rib there is frequently a tendinous intersection.

The action of the internal oblique may be said to be nearly the same as that of the external oblique muscle.

Plate III. exhibits on the left side the transversalis muscle, marked with the letters I, the external f and the internal oblique G, g, g, muscles being both partially removed; while on the right side, the rectus and pyramidalis muscles are detached, and the tendons of the three lateral muscles, the external oblique, the internal oblique, and the transversalis, are cut from that part where they formed the linea

alba *f*, the transversalis i being so reflected as to exhibit the peritoneum *a*.

The musculus transversus abdominis I, i, i, i,* situated in the lateral and anterior aspects of the abdomen, derives its origin fleshy from the cartilages of the seven inferior ribs, letters A, where their concave surfaces look to the abdominal cavity; tendinous from the fascia lumborum, or from the transverse processes of the last dorsal and all the lumbar vertebræ; fleshy from the ventral margin of the crista ilia S, S, and fleshy from the iliac portion K of the fascia lata. The fibres proceed directly across, become tendinous at i, i, i, where they contribute to form the linea semilunaris, and unite with the posterior tendinous layer, letters *g*, of the internal oblique muscle G, which they accompany beneath or centrad to the rectus onwards to be inserted into the linea alba *f*: but nearly intermediate to the umbilicus and pubes, the tendinous expanse proceeds along with the internal oblique superficially or dermad to the rectus, as seen on the right side of the subject, near that part where the epigastric artery x is truncated; there being only the peritoneum *a* behind or centrad to the rectus muscle R in this region.

Where the muscle arises from the cartilages of the ribs, the digitations intermingle with the origins of the diaphragm, as seen in Plate IV.; where it derives origin from the fascia lumborum, the internal oblique and transversalis muscles are inseparable; and at its origin from the fascia lata, these muscles are equally inseparable: here they conjointly form a musculo-tendinous expanse, giving transmission to the spermatic cord in the male, and to the round ligament in the female, and are inserted into the crista and spine *t* of the os pubis, and into the linea-ilio-

* Syn. Transversus; transversalis; transversalis abdominis; lumbo-ili-abdominal; and lombo-abdominal.

pectinea *p* contiguous,* as seen on the right side of the subject, marked with the letter i, close to the spine *r*, of

* We observe on the right side of the subject, that the spermatic cord, marked *g*, formed by the vas deferens v and the plexus of vessels emerging from behind the peritoneum *a*, descends obliquely from the abdominal cavity on the iliac and dermal aspect, or superficially and outwardly, to the epigastric artery x, and vein *x*, through the transversalis muscle i, and the internal oblique muscle g, as represented on the left side, and on its emergence from the latter muscle, the cord receives the cremaster muscle a, then continues its course between the internal oblique and external oblique muscles, as seen in Plate II., the latter of which muscles the cord pierces, as seen in Plate I., proceeding downwards to the testis, as represented in Part III., Plates XV. and XVI. Thus there is formed a long tube or canal, named inguinal, the external oblique muscle forming the external, and the transversalis muscle the internal aperture. In this description, I have followed Nature, and the authority of Vesalius and the earlier anatomists. Monro *primus*, in the Edinburgh Medical Essays and Observations, vol. 5., gives a simple and clear account of the course of the spermatic cord. The fascia transversalis is simply that portion of the transversalis muscle which is pierced by the spermatic cord. When rupture takes place, the viscera descend generally between the cremaster muscle a, and the spermatic cord; sometimes, though rarely, between the objects forming the cord; and equally seldom beneath or sacrad to the spermatic cord: on as few occasions, the viscera protrude not down along the inguinal canal, but at once through the transversalis, and the internal oblique muscles opposite the external aperture formed by the external oblique muscle: this latter is named ventro-inguinal, the former inguinal hernia or bubonocele. When the viscera are strangulated, and an operation deemed requisite, the first incisions are made through the skin, cellular substance, and cremaster muscle, down to the herniary sac formed by the peritoneum, without the possibility generally of discriminating between the cellular substance and muscle. In all the instances I have either witnessed the operation or performed it myself, I have never been able to distinguish a fascia superficialis, or propria, or a cremaster muscle. I have in the first or second incision arrived at the herniary sac, which should be opened at the most depending part of the tumour, by a horizontal incision of the scalpel, the sac being previously pinched up with the dissecting forceps; the sac must be freely laid open by cutting on a director with a probe-pointed bistoury upwards to the stricture; the latter as well as the former or sac, are to be cut directly upwards with the same instruments; but occasionally the quantity of intestine protruded is so bulky, that a probe-pointed bistoury cannot be inserted, and then it is requisite to employ a sharp-pointed bistoury to cut open, first the stricture, and secondly the sac. This I have had occasion to do more than once. The reason of cutting directly upwards in this hernia, is, to avoid the epigastric artery in the event of the protrusion being ventro-inguinal, a circumstance only to

the os pubis. On the left side, between the transversalis I, and the internal oblique g, muscles, the circumflex iliac artery *c*, is observed running between them and dividing into branches.*

The function of the transversalis may be said to be nearly the same as that of either the external or internal oblique muscles; for one and all of them are concerned in the same functions. Individually, they so compress the abdomen in different directions, as more effectually to accomplish their numerous actions.

The musculus rectus abdominis,† letters R, Plates I. and II., situated in the anterior or sternal aspect of the abdomen, between the tendinous layers of the internal oblique muscle, derives its origin from the crista of the os pubis, being overlapped by the pyramidalis muscle T, ascends with longitudinal fibres parallel to the linea alba *f*,

be learned during the operation. The same observation of our ignorance of the species of hernia, applies to inguinal and crural occurring in the female, for the apertures are so contiguous, that the nature of the hernia cannot be ascertained till the operation is begun. In inguinal hernia, after the stricture is removed, which is generally caused by the tendon of the external oblique muscle, seldom by the conjoint internal oblique and transversalis muscles, the viscera are to be returned, pushing them gently upwards and outwards, and in the reverse order from that in which they descended. The position of the body and limb ought to be the same with that for crural hernia, as described in page 4. The same directions are applicable to reduction before operating. Stitches should be applied to this wound, and should pass deeply in the muscles to prevent a disposition to a recurrence of the disease. The patient should have the nates raised by one or two pillows during the after treatment, and have an emollient enema exhibited immediately after the operation.

* From the magnitude of this artery we observe the reason for objecting against puncturing the abdomen for ascites, between the umbilicus U, and the anterior superior spinous process C of the os ilium; the operation is now almost invariably performed between the umbilicus and pubes in the linea alba, care being taken that the urinary bladder is emptied immediately before.

† Syn. Rectus, præter ejus principium superius; rectus; costo-pubien; sterno-pubien; pubio-sternal.

upwards or atlantad; and is inserted into the sternum, the seventh, sixth, and fifth ribs. In this course three or more tendinous intersections r, r, r, r, occur, which are intimately connected with the anterior tendinous layer of the internal oblique muscle. This muscle is concerned in the same functions as the three lateral muscles last described. When the pelvis is fixed, the two muscles will bend the thorax forwards and downwards; and when the thorax becomes fixed, they will raise the pelvis: through the medium of the adhesions of the tendinous intersections to the tendon of the internal oblique muscle, each intermediate arrangement of fleshy fibres will be enabled to act independently.

In Plate II., three fourths of the rectus muscle R, are removed on the right side,* displaying the relation that the muscle bears to the epigastric artery x, which is observed to inosculate with the internal mammary artery 14, seen also in Part II., Plates I. and III.*

The musculus pyramidalis T,† of Plate I., is situated in the anterior aspect of the abdomen near the pubes, and is

* The rectus muscle and epigastric artery relate to the cæsarian section, to the securing of the abdominal aorta, and to the extirpation of tumours in the abdomen; in the first of these, previous to the operation, the recti muscles are separated from each other at the linea alba to the distance of nearly three inches, and the epigastric artery removed along with them; this fact I have repeatedly witnessed in women who have died immediately after child-birth, so that in this operation there is little fear of wounding the epigastric artery. The incision should be made on the left side, and parallel to the linea alba, sufficiently remote to descend in the fibres of the rectus, that the patient afterwards may not be subject to ventral hernia. The same longitudinal incision is applicable in the two latter cases, only it should be made closer to the linea alba, provided there is no enlargement of the abdominal cavity.

† Syn. An musculus parvus qui procedit a fine musculi longitudinalis. Musculus succenturiatus. Superius principium recti abdominis. Musculus totus carnosus. Carneum operculum. Carneum. Pubio-ombilical. Pubio-sous-ombilical.

properly an appendix to the rectus muscle R, being sometimes deficient. The pyramidalis deriving its origin from the crista of the os pubis, close to the symphysis, and superficially or dermad to the origin of the rectus, ascends close to the linea alba *f*, becoming narrower and smaller, till it terminates intermediate to the pubes and umbilicus. This muscle assists the rectus in its functions.*

In Plates II. III. and VI. the intercostal muscles are depicted; in Plate II. both the external z, and internal x are drawn, in Plate III. only the internal x, and in Plate VI. merely the external z. In the second Plate, the internal x are more faithfully represented.

The musculi intercostales externi, letters z,† are situated between the ribs, as their name indicates; they lie externally or dermad to the internal intercostals, and are covered by several muscles attached and passing over the ribs. They derive their origin, which is partly fleshy and partly tendinous, from the inferior or sacral margins of the ribs, and descend obliquely forwards or sternad, to be inserted, also partly fleshy and partly tendinous, into

* The pyramidalis muscle relates to puncturing the urinary bladder, and to performing the operation of lithotomy above the pubes; both of which modes of operating are objectionable, and scarcely ever necessary. In advanced life, when the prostate gland is enlarged and indurated, lithotomy in this region may be preferable, but the prostate is seldom so large that we cannot puncture the bladder per rectum. When lithotomy is requisite, the urinary bladder must be distended as much as possible, with tepid water introduced by a catheter in the urethra: an incision is to be made in the linea alba, between the two pyramidal muscles, sufficiently extensive to admit the extraction of the calculus, the size of which having been previously ascertained by sounding, and the introduction of the fingers per rectum. The urinary bladder is then laid open, the operator carefully avoiding the peritoneum covering the fundus, as delineated in Part II., Plate I., *a* indicating the peritoneum, *m* the urinary bladder. Lithotomy will be more particularly described in the Part illustrative of the male organs of generation.

† Syn. Inter-lateri-costaux. Intercostales exteriores.

the upper or atlantal margins of the contiguous ribs. They extend from the spine or vertebral column forwards to the cartilages, where they become more a tendinous expanse than distinct muscular slips. Near the spine, a series of the external intercostals, marked z in Plate VI., appear longer, and are named the LEVATORES COSTARUM; they derive their origin from the transverse processes of the dorsal vertebræ, and descend to be inserted into the contiguous lower rib; the more sacral, generally three or four of them, descending over the nearest rib to be inserted into the second; the former are by Albinus denominated levatores costarum breviores, and the latter levatores costarum longiores.

The musculi intercostales interni, letters x,* are situated immediately beneath, or centrad to the external intercostals, and have an opposite direction of fibres, as represented in Plate III. They arise from the superior or atlantal margins of the ribs, and ascend obliquely forwards or sternad, to be inserted into the inferior or sacral margins of the contiguous ribs. The internal intercostal muscles extend from the sternum backwards to the angles of the ribs, which is only seen within the thoracic cavity, by detaching the pleura costalis. Some of them near the posterior angle extend over the neighbouring rib, and are attached to the second. In Plate II., between the first two upper ribs, both layers of intercostal muscles are exhibited; and we observe the external bold and thick posteriorly or dorsad, but so thin and scattered anteriorly or sternad, that the internal are observed beneath them crossing in the opposite direction, in such a manner as to represent corruscations. Between the next two

* Syn. Inter-pleuri-costaax. Intercostales interiores.

ribs, a portion of the external layer z is reflected, and the internal layer x is brought into view.

The intercostal muscles elevate the ribs from the obtuse angles which they form with the spine, near to a right angle, and both seem to co-operate in this action; and as they peculiarly either terminate or cross at the posterior angles, and at the anterior angles formed by their cartilages, are hence well adapted for this purpose. By this action the capacity of the thorax is dilated, so that they are concerned in respiration or in inspiration, provided this function is active. The internal intercostals, particularly where they are inserted into the cartilages, will depress the ribs, and hence act in expiration. These intercostal muscles are concerned in fractured ribs, and in paracentesis thoracis.

The sterno-costalis,* delineated in Part II., Plate III., *Fig.* 2, marked B, is situated on the thoracic surface of the sternum and ribs, invested with the pleura; deriving its origin from the two inferior or sacral portions of the sternum, and ascending obliquely upwards and outwards in a radiating manner, to be inserted into the second, third, fourth, fifth and sixth ribs. The muscle is observed to derive its origin, fleshy and tendinous, from the edge of the ensiform cartilage, and the portion of the sternum atlantad, and to be inserted by triangular tendinous and fleshy slips. This muscle approximates the ribs to the sternum, or depresses them, or it may depress the sternum, and is therefore employed in expiration.

* Syn. Sextus in altero latere thoracem hominis moventium. Sextus thoracis. Qui internæ sterni sedi apponitur. Triangularis et pectoralis internus. Triangularis. Sterno-costales. Triangulares sterni. Triangularis sterni. Sterno-costaux. Sterno-costal.

PLATE IV.

Is a delineation of the diaphragma or diaphragm B, b, b,* or muscular partition between the thoracic and abdominal cavities, which is also represented in Part II., Plates I., IV., and V., letters B. Towards the thorax, the muscle is convex, as seen in Part II., Plate I., and invested with the pleura; and towards the abdomen it is concave, as here depicted, and lined with the peritoneum, which has been removed to exhibit the arrangement of the muscular fibres. This muscle derives its origin from the central aspect of the ensiform cartilage *e*, from the same aspect of the cartilages A of the six inferior or sacral ribs of each side, from the ligamenta arcuata D, and from the sides of the bodies of the lumbar vertebræ.† The muscular fibres emanating from this circumference, concentrate, and form a central tendon B, which gives transmission to the vena cava inferior *i* on the right, to the œsophagus I ‡ nearly in the centre, and to the aorta e §, posteriorly or dorsad.

Where the diaphragm takes its origin from the ensiform cartilage *e*, the muscle is extremely thin, the pleura and

* Syn. Midriff. Septum musculare. Septum transversum. Thoracico-abdominal.

† These origins are generally described as arising distinctly from the second, third, and fourth lumbar vertebræ; but there is as frequently an origin from the first and last vertebræ, as from any of the intermediate.—*Vide Soemmering de corporis humani fabrica.*

‡ The par vagum descend along with the œsophagus from the thorax to the abdomen.

§ The vena azygos and thoracic duct ascend from the abdomen to the thorax, at the same aperture that the aorta descends; but the splanchnic nerves, and the trunks of the great intercostals, pierce the muscular-fibres of the diaphragm, as seen in Part II., Plates IV. and V. The splanchnic nerve is marked 17, and the intercostal 7.

peritoneum almost uniting: and in some instances these membranes are only separated by cellular substance. Where the muscle arises from the ligamentum arcuatum D, its fibres appear to intermingle with those of the quadratus lumborum C, and the psoas magnus K;* where they derive their origin from the sides of the lumbar vertebræ, they are generally strong and tendinous, particularly on the right side, and have been generally regarded as a distinct muscle, named the lesser muscle of the diaphragm; the other origins from the ribs and sternum being considered the greater or larger. These fibres from the vertebræ beautifully cross each other over the aorta E, and ultimately interlace those from the ribs and sternum, one and all of the fibres intermingling with each other in the central tendon, where the œsophagus and vena cava pierce.

The diaphragm is the chief muscle concerned in the function of respiration, and from the tendency to a vacuum in the thoracic cavity, presents a convex surface, which extends atlantad or upwards to the fourth rib, in its quiescent state; on which account the slightest contraction of its fibres enlarges the cavity to a considerable extent. In gentle respiration, or that which takes place during sleep, this muscle alone seems to act; and from its great expanse, and this surprising disposition, appears adequate to the function. In gentle inspiration, the fibres being thrown into moderate action, place the surface more in the position of a horizontal plane; and in violent inspiration the abdominal aspect becomes convex, the thoracic concave, by the fibres from the lumbar vertebræ acting with energy, and pulling downwards or sacrad the central tendinous expanse: in

* The ligamentum arcuatum is the arched tendinous expanse between these muscles, and is generally fixed to the last rib and the lumbar vertebræ: it is sometimes so thin as not to be very distinct.

both of these the abdominal viscera are forced downwards and forwards, or sacrad and pubic. In expiration, the fibres act with vigour, this being the chief active function of the muscle; they pull the sternum and ribs inwards or centrad towards their central tendon, which being attached to the pericardium in the thoracic cavity, enables the diaphragm to perform this action vigorously. This attachment limits the descent of the central tendon into the abdominal cavity in inspiration. In the dead state, when the diaphragm is viewed from the abdomen, it is concave, and remarkably tense; but when air is admitted into the thoracic cavity, it is thrown into large folds, and becomes loose and floating.*

PLATES V. VI. AND VII.

On removing the thick and tough integuments of the back†, we expose the muscles, which are represented on the right side of Plate V.; and when these are detached, we bring into view those exhibited on the left. On the right half of the back the trapezius muscle 80 occupies nearly the upper portion, and the latissimus dorsi the lower. Superiorly or atlantad to the trapezius 80, the insertion E of the sterno-cleido-mastoideus, part of the splenius capitis p, and part of the complexus o muscles appear; and inferiorly or sacrad to the trapezius 80, or between it and the latissimus dorsi muscle R, a portion of the rhomboideus muscle T is seen.

* In relation to pathology, the diaphragm is subject to inflammation, and is sometimes ulcerated through in abcess of the liver. Hernia, or transposition of the abdominal viscera into the thorax, occurs both in the fetal and the adult state.

† From this structure, the integuments at this part of the back, when inflamed, terminate generally in mortification, as occurs in carbuncle, and that brutal degrading practice of flogging.

The trapezius 80,* situated in the upper or atlantal half of the dorsal aspect of the trunk, arises tendinous from the superior transverse ridge b at the side of the protuberance *a* of the occipital bone, tendinous from the ligamentum nuchæ,† and tendinous and fleshy from the spinous processes of the two inferior cervical, and all those of the dorsal vertebræ; the fibres proceed converging from this extent of origin across the back, and are inserted tendinous and fleshy into the superior or atlantal margins of the spine *h*, and acromion D of the scapula, and the scapulary third of the clavicle. Where the muscle derives its origin from the occipital bone, there is generally a tendinous expanse extending to the sterno-cleido-mastoideus muscle E, that conceals the superior fibres of the splenius capitis muscle p, which has been here removed to exhibit the latter muscle. The fibres of the trapezius at this part are generally thin and scattered. In its descent along the neck, the muscle occasionally has no adhesion to the cervical vertebræ, but only to the ligamentum nuchæ when this latter is merely attached to the dorsal vertebræ. At the inferior or sacral origin of the muscle, the connexions with the dorsal vertebræ are very various, the muscle sometimes not descending further than the eighth dorsal vertebra. When the trapezii muscles are on the stretch, ligaments are observed extending

* Syn. Cucullaris; Trapezius; Cucullaris et Trapezius; Secundus scapulam moventium; Occipiti-dorso-clavi-sus-acromien; Dorso-sus-acromien.

† The ligamentum nuchæ is a strong elastic ligamentous rope, extending between the spinous processes of the cervical vertebræ, and the upper or coronal portion of the perpendicular ridge of the occipital bone contiguous to the protuberance *a*, and is in a considerable measure formed by the union of the trapezii muscles. In general, this ligament adheres only to the spinous processes of the lower cervical vertebræ and the occipital bone; but sometimes it is merely attached to those of the superior dorsal vertebræ and occipital bone. This ligament is bold in advanced life, and is still bolder and stronger in the graminivorous animals.

between the spinous processes of the dorsal vertebræ, that are named interspinous, but which are sometimes described as muscles.* The insertion of the muscle into the root of the spine *h* of the scapula is generally connected to the fascia covering the infra-spinatus muscle 81, and overlaps the origin of the deltoid muscle B: the insertion here is purely tendinous, but as it proceeds around to the clavicle, the muscle becomes more and more fleshy, as observed in Part II., Plates VIII. and IX.

When the head and trunk are fixed, the function of this muscle, its fibres acting conjointly, is to pull the bones of the shoulder directly dorsad to the spine. When the same points remain fixed, and the superior or atlantal are thrown into action, they elevate the clavicle and scapula towards the head and neck; when the central fibres alone act, they draw these bones in a similar direction to the entire muscle; and when the inferior or sacral oblique fibres act, they depress these bones. From these actions it will be evident, that any individual fasciculus of a muscle can act independently, and that these may perform a circular movement of the bones of the shoulder. When the clavicle and scapula become fixed points, the muscle acts in the opposite direction, depressing the head to the shoulder, and inflecting the spine either downwards or upwards. This muscle is one of the chief supporters of the head in the infantile state.

The latissimus dorsi muscle,† letters E, derives its origin tendinous from nearly the posterior or dorsal half of the crista s of the os ilium, tendinous from the spinous

* Syn. Interspinales dorsi; Les petits épineux du dos; Lumbo-dorso-spinal.

† Syn. Quartus brachium moventium; Quartus humeri musculus; Quartus musculus movens humerum; Latissimus, ani scalptor, aut dorsalis maximus; Ani scalptor, ani tersor, latissimus; Latissimus dorsi sive ani scalptor; Le grand dorsal ou très large du dos; Lombo-huméral; Dorsi-lumbo-sacro-huméral.

processes *e* of the os sacrum, of the lumbar, and of the seven inferior or dorsal vertebræ; these tendinous origins soon become fleshy, and ascend obliquely upwards and forwards, or sternad and atlantad, over the ribs, deriving additional fleshy origins from the four or five inferior ribs in their course, and adhering to the inferior angle * of the scapula, as they glide over that bone, where they converge and become connected with the teres major muscle F, with which they ultimately form a conjoint tendon, that is inserted into the ulnar ridge of the bicipital groove of the os brachii, as seen in Part III., Plate XI., *Fig.* 1, also in Plates VIII. and IX. of Part V.

Where the latissimus dorsi arises anteriorly or sternad from the crista s of the os ilium, it is extremely delicate, soon becomes fleshy, and overlaps the obliquus externus abdominis F, as observed on the left side of the subject. The origins from the dorsal vertebræ are covered by the trapezius muscle 80; the origins from the ribs are delineated in Plate I, marked E, where they are observed to intermingle with the digitations F of the external oblique muscle, and the digitations o of the serratus major anticus muscle. The muscle, immediately before its insertion, forms a peculiar turn or twist, so as to appear superiorly or atlantad or radiad to the teres major muscle F, distinctly seen in Part III., Plate XI., *Fig.* 1, also in Plates VIII. and IX. of Part V. Here these two muscles form the inferior and outer, or the ulnar and dorsal fold of the axilla, and relate to the securing of the axillary artery, and to ampu-

* The connexion of the fibres of the latissimus dorsi muscle by cellular membrane to the scapula in their course over the inferior angle to their destination, should be considered by the practitioner, as this point of the bone is sometimes forced above the margin of the muscle, so as to prove a troublesome accident. The muscle requires to be relaxed, and then put in situation, and kept so by Dessault's bandage for fractured clavicle.

tation at the shoulder-joint as detailed in Part III., also to dislocation of this joint as will be described in Part V.

The function of the latissimus dorsi, is to pull the arm or os brachii downwards and backwards, or sacrad and dorsad, as in one of the motions of the sabre exercise; and also contributes to pronate the hand by rolling inwards or ulnad the os brachii on the glenoid cavity of the scapula. When the arm is the fixed point, this muscle aids us in bringing the trunk to the arm.

Beneath or centrad to the trapezius and latissimus dorsi muscles, appear the rhomboidei T, t, and the serratus posticus inferior H; the former below the trapezius, and the latter under the latissimus dorsi. The rhomboidei muscles T, t,* are situated nearly in the centre of the back, immediately beneath or centrad to the trapezius 80, extending between the spine and the scapula, and are generally considered as two muscles, although they are only one; hence Bidloo observes, that he never saw the minor. Wherever anatomy can be simplified, it certainly should, and consequently as these muscles in nine cases out of ten require more than common dissection to separate them, and as they perform the same function, they ought to be described as one muscle, deriving its origin chiefly tendinous from the spinous processes of the two or three inferior or sacral cervical, and the four or five superior or atlantal dorsal vertebræ; the fleshy fibres descending obliquely across the back, to be inserted into the base of the scapula *c*, c, c, from a little above or atlantad to the

* Syn. of Rhomboideus major. Est pars major quarti scapulam moventium. Quarti scapulæ musculi. Rhomboidis. The inferior part of the rhomboides. La portion inférieure du rhomboide. Cervici-dorso-scapulaire. Dorso-scapulaire. Syn. of rhomboideus minor. Est pars quarti scapulam moventium. Quarti scapulæ musculi. Octavus omoplatæ. Syn. of both muscles, Rhomboidis of Laurentius; superior and inferior parts of the rhomboïdes of Douglas and Cowper; and the same of Winslow; Le Rhomboïde of Sabatier, Boyer, Bichat, and Portal.

root of the spine downwards to the inferior angle. That portion of the muscle marked t, is the rhomboideus minor, and is observed to be separated by a slight shading from the major, marked T. Where the muscle arises from the cervical vertebræ, it is generally connected to the ligamentum nuchæ. The insertion of the rhomboidei is also seen in Plate VI. The rhomboidei elevate the scapula upwards and backwards, or atlantad and dorsad; and when the scapula is made the fixed point, they approximate the spine to the shoulder.

Serratus posticus inferior H* is situated in the inferior or sacral region of the back, immediately beneath or centrad to the latissimus dorsi muscle, along with which it arises by a conjoint tendon from the spinous processes of the two or three inferior or sacral dorsal vertebræ, and the three or four superior or atlantal lumbar vertebræ. The tendinous fibres ascend obliquely forwards or sternad, becoming partly fleshy, to be inserted into the four or five inferior or sacral ribs. The origin of this muscle contributes to form what is named the fascia lumborum, described in page 6, and is inseparable from the latissimus dorsi. The insertions are frequently very thin and scattered, indeed the whole muscle is sometimes so slender, that it can be with difficulty distinguished from a tendinous expanse, continuous and parallel with it upwards or atlantad to the superior serratus: beneath this expanse, the tendons d, d, d, of the sacro-lumbalis, and those k, k, k, of the longissimus dorsi muscles, are observed shining through, as represented in the drawing.

The inferior serratus muscle pulls the ribs downwards

* Quintus in altero latere thoracem hominis moventium. Quartus thoracis musculus. Musculus ad infimam dorsi partem, una cum alio musculo exiguo praedicto superposito. Le dentelé postérieur inférieur. Petit dentelé postérieur inférieur. Petit dentelé inférieur. Lombo-costal. Dorsi-lumbo-costal.

and backwards, or sacrad and dorsad, and is therefore a muscle engaged in expiration.

The levator scapulæ 40* is situated superiorly or atlantad to the rhomboideus T, t, occupies the lateral aspect of the neck, and divides in a manner the anterior or sternal, from the posterior or dorsal muscles. This muscle derives its origin from the transverse processes of the four or five superior or atlantal cervical vertebræ, and descends obliquely in fleshy bundles, to be inserted into the superior portion r, of the base of the scapula, that is not occupied by the rhomboideus muscle. The origins of this muscle are partly fleshy and partly tendinous, intermingling with the tendons of the splenius colli, *p*, on the one side, and those of the scalenus posticus 50 on the other, as delineated in Plate VI. An anterior or sternal view of these muscles is given in Part II., Plate VII. The insertion of the muscle is very fleshy, and extends from the superior posterior angle, to the angular projection, a little above the root of the spine of the scapula. The insertion is also seen in Plate VI. For a more minute insertion of this muscle, consult description of scapula in Part I.

The name of this muscle indicates its chief function; but when the scapula is fixed, it will inflect the neck and head laterad.

On detaching the rhomboideus T, t, Plate V., the serratus superior posticus† E, Plate VI., is brought into

* Syn. Tertius hominis scapulam moventium. Tertius scapulæ musculus. Levatores proprii. Levator. Scapulam attollens, levator, patientiæ musculus. Elevator seu musculus patientiæ. Le releveur propre de l'Omoplate. L'Angulaire, dit communement releveur propre. Levator anguli scapulæ. Trachélo-scapulaire. Trachélo-anguli-scapulaire.

† Syn. Tertius in altero latere thoracem hominis moventium. Tertius thoracis musculus. Musculus ad supremam dorsi partem prope cervicem. Le dentelé postérieur supérieur. Petit dentelé postérieur supérieur. Petit dentelé supérieur. Dorso-costal. Cervici-dorso-costal.

view, extending between the spine and the superior or atlantal ribs. This muscle derives its origin tendinous from the spinous processes of the three or four inferior cervical, and the two or three superior dorsal vertebræ, descending obliquely to be implanted by fleshy digitations into the second, third, and fourth, and occasionally the fifth ribs, sternad or forwards to their angles. I have described this muscle as arising from the three or four cervical, and two or three dorsal vertebræ, since it, and all the muscles of the back, have so various an origin, that it appears preferable to commit to memory a general than a particular origin. Its function is to elevate the ribs in increased inspiration; and when the ribs become the fixed point, to inflect the neck laterad, but when both muscles act, to inflect it dorsad.

The splenius capitis et colli*, delineated in Plates V. and VI., and marked with the letters p, *p*, is situated in the posterior or dorsal aspect of the neck, covered by the trapezius, rhomboideus, and serratus superior posticus muscles, and extends obliquely upwards from the spine to the occiput. This muscle derives its origin partly tendinous and partly fleshy from the spinous processes of the five or six superior dorsal, and the five inferior cervical vertebræ, ascending obliquely outwards or laterad, to be inserted tendinous and fleshy into the depression immediately beneath or basilad to the superior or coronal transverse ridge b of the occipital bone, and the mastoid

* Syn. Primi paris musculorum aut caput, aut primam vertebram moventium, pars quæ in occipitium finit; et pars quæ in transversos vertebrarum processus nexum mollitur. Primi moventis caput, in occipitium implantata, et in processus transversos inserta. Pars ejus qui a recentioribus anatomicis ante alios descriptus, primum par caput extendentium. Splenii. Triangularis splenii. Superior et inferior splenii. Splenii inserta processui mammillari et inserta vertebris colli. La portion supérieure et inférieure du splénius ou mastoïdien postérieur. Splénius de la tête et splénius du cou. Cervico-mastoïdien et dorso-trachélien. Cervico-*dorso*-mastoïdien et dorso-trachélien.

process *m* of the temporal bone, and into the transverse processes of the four or five superior cervical vertebræ. Where the muscle arises, there is no division into origin of capitis et colli, and the atlantal or superior portion is not connected with the cervical vertebræ, but to the ligamentum nuchæ. The insertions into the transverse processes of the cervical vertebræ are elegant small tendons, like all those muscles connected with the same processes of these vertebræ. Those of the levator scapulæ are on the one or tracheal side, and those of the trachelo-mastoideus F, as seen in Plate VII., are on the other or dorsal side. The insertion into the temporal and occipital bones is concealed by the sterno-cleido-mastoideus E, Plate V.

The action of this muscle is to inflect the head and neck backwards, to rotate the head on the vertebra dentata, and to rotate the cervical vertebræ.

When the preceding dorsal muscles are detached, there are brought into view several muscles extending the whole length of the back, the sacro-lumbalis, marked with the letters D, d; the longissimus dorsi K, k; and the spinalis dorsi L; the semi-spinalis dorsi M, and the semi-spinalis colli N: the two latter are only seen in Plate VII.

The sacro-lumbalis* D, and the longissimus dorsi† K muscles, arise conjointly, partly tendinous and partly fleshy, from the posterior or dorsal aspect of the crista s of the

* Syn. Quartus in altero latere hominis thoracem moventium. Quintus thoracis musculus. Quartus thoracis musculus. Sacro-lumbus. Alius præterea in dorso musculus, qui cum spinalibus musculus pertinacissime commiscetur. Sacro-lumbus, una cum inferiore parte cervicalis descendentis. La portion externe ou dorso-trachélienne du sacro-spinal. Le lumbo-costo-trachélien.

† Syn. Undecimus et duodecimus dorsum moventium. Secundus musculus dorsi. Quinti paris dorsi musculorum, præter partem spinis vertebrarum thoracis insertam. Semi-spinatus. Longissimus dorsi præter partem quæ inserta spinis thoracis. Longissimus. Le long dorsal. Portion costo-trachélienne du sacro-spinal. Lombo-dorso-trachélien.

os ilium, from the spinous processes and dorsum of the os sacrum, and from the spinous and transverse processes of the lumbar vertebræ. The sacro-lumbalis D ascending, soon terminates in an elegant arrangement of tendons, marked with the letters d, that are inserted into the ribs near their angles. The origin of the sacro-lumbalis is more fleshy than that of the longissimus dorsi, if we separate with violence the two muscles downwards or sacrad to the crista of the os ilium. The manner of separating these two muscles, for they appear one and the same in the drawing, and one and the same in nature, is to press the tendons letters d of this muscle to the sternal side, and gently the fleshy mass k of the longissimus dorsi towards the spinal column; then to insulate them either with the cutting edge or handle of the scalpel or with the finger, upwards to the first rib, and downwards to the last rib, where they are so incorporated, as not to admit of further separation. When this is done, a number of small muscles, named accessory, may be seen deriving their origin tendinous from the superior or atlantal eight or nine ribs, and joining the fleshy mass of the sacro-lumbalis; three of them are represented on the right side of this Plate VI., marked *d*, truncated where they joined the body of the muscle. The tendons of this muscle become longer and more elegant in their ascent.

This muscle, from its numerous attachments, has a variety of motions; when the origin of the muscle is fixed, it elevates and inflects the thorax backwards or dorsad, and to one side; and in active respiration, depresses and approximates the ribs, so as to assist in expiration: when the tendons become the fixed point, the muscle will elevate and inflect dorsad or backwards the pelvis on the thorax; and in active respiration, the musculi accessorii will raise the ribs in inspiration.

The longissimus dorsi muscle K, k, the situation and origin of which have been described along with the preceding muscle, ascends parallel to the sacro-lumbalis, and is inserted into the ribs between their tubercles and angles, and into the transverse processes of the dorsal vertebræ.

The origin of the longissimus dorsi appears entirely tendinous, but beneath or centrad is fleshy, where the muscle arises from the transverse processes of the lumbar vertebræ. In its ascent on the spinal margin, this muscle is connected with the spinalis dorsi L, either by tendinous or carneous fibres. The insertions into the ribs are chiefly tendinous, and are attached generally to the superior or atlantal ten; they are seen on the right side of this Plate VI., marked *k*, being only displayed when the muscle is separated from the sacro-lumbalis: the insertions into the transverse processes of the dorsal vertebræ are commonly small double tendons, and can be only seen by separating this muscle from the spinalis dorsi L.

The functions of this muscle resemble those of the sacro-lumbalis in depressing the ribs, in inflecting the thorax dorsad, in elevating the pelvis, and inflecting it dorsad. This muscle assists to inflect the spine laterad.

The spinalis dorsi muscle L,* situated nearer the spinal column than the longissimus dorsi K, k, derives its origin, in connexion with that muscle, from the spinous processes of the three or four inferior dorsal, and the two or three superior lumbar vertebræ; ascends between the longissimus dorsi K, k, and the spine, soon becoming fleshy and again tendinous, to be inserted by small ten-

* Syn. Quinti paris dorsi musculorum, pars implantata in spinas vertebrarum thoracis. Semi-spinati. Dorsi longissimi pars, quæ inserta spinis thoracis. Le grand épineux du dos. Lumbo-dorso-spinal.

dons into the spinous processes of the eight or nine superior dorsal vertebræ. The origin of this muscle is connected either by carneous or tendinous fibres to the longissimus dorsi, generally by the latter, which are equally strong with those of the longissimus, of which it evidently forms a part. The tendinous insertions intermingle with those of the semi-spinalis dorsi. This muscle inflects the dorsal vertebræ laterad, and when the muscle of the opposite side acts, they inflect the spine dorsad.

The semi-spinalis dorsi muscle M,* Plate VII., properly the continuation of the spinalis dorsi, as they appear one and the same muscle, arises from the transverse processes of the seventh, eighth, and ninth dorsal vertebræ; ascends with oblique fibres close to the spine, to be inserted into the spinous processes of the two or three inferior or sacral cervical, and the five superior or atlantal dorsal vertebræ. The origin of this muscle is lateral to the insertion of the spinalis dorsi, and mesial to the origin of the semi-spinalis colli N, of Plate VII. The insertion in some measure overlaps that of the spinalis dorsi.

The function of this muscle is to assist the former in inflecting the spine laterad, and when the opposite muscle acts, to bend the spine dorsad.

The semi-spinalis colli N, Plate VII.,† apparently the continuation of the semi-spinalis dorsi, is situated on the sides of the cervical vertebræ, beneath the complexus O, and

* Syn. Semi-spinalis. Les vertebraux externes du demi-épineux, ou transversaire épineux du dos. Transverso-spinal. La portion lombo-cervicale du sacro-spinal.

† Syn. Est pars septimi et octavi dorsum moventium. Quarti cervicis musculi. Tertii paris dorsi musculorum. Spinati. Spinalis colli. Spinalis. Les vertebraux externes du demi-épineux, ou tranversaire épineux du col. La portion lombo-cervicale du sacro-spinal. Transverso-spinal.

derives its origin from the transverse processes of the five or six superior dorsal vertebræ; ascends with oblique fibres, which are inserted into the spinous processes of the cervical vertebræ. The origin of this muscle, which is tendinous, lies between the semi-spinalis dorsi and the complexus; and its insertion, which is fleshy, covers at the sacral portion the insertion of the semi-spinalis dorsi. Its use is to inflect the neck laterad, and when both muscles act, to inflect the cervical vertebræ dorsad.

When the spinalis dorsi L, the semi-spinalis dorsi M, and the semi-spinalis colli N muscles, are detached from the spine, there appear a multiplicity of oblique muscular fibres, extending between the transverse processes of the vertebræ, and the spinous processes of the same bones, which have acquired the name of multifidus spinæ,* marked Q on the right side in Plate VI. Inferiorly the muscle arises from the dorsum of the os sacrum, the posterior contiguous part of the os ilium, the articular and transverse processes of the lumbar vertebræ, the transverse processes of the dorsal and cervical vertebræ, excepting the three superior of the latter. The muscular fibres ascend obliquely to be inserted into the spinous processes of the lumbar, dorsal, and cervical vertebræ, with the exception of the dentata

* Syn. Pars ejus, quæ in lumbis est decimus tertius, et decimus quartus dorsum moventium; Quæ in dorso, est decimus quintus, et decimus sextus dorsum moventium; Quæ in collo, est pars septimi et octavi dorsum moventium. Tertius dorsi musculus; Quartus dorsi musculus; Quarti cervicis musculi. Pars tertii paris dorsi musculorum; quæ in lumbis et dorso, est quarti paris dorsi musculorum. An sacer; quæ in collo pars spinati; quæ in dorso semi-spinati; quæ in lumbis, paris sacri. Transversalis colli; Semi-spinatus; sacer. Transversalis; transversalis dorsis interiores; transversalis lumborum, vulgo sacer; portiones distinctæ in cervice, sunt haud dubie intervertebrales. Sunt les vertebraux internes du demi-épineux, ou transversaire épineux du col: les demi-épineux, ou transversaire épineux du dos, aut fortasse ejus tantum partes internæ: le transversaire épineux des lombes, anciennement le sacré. La portion lombo-cervicale du sacro-spinal. Le transverso-spinal.

and atlas. The origins of this muscle are observed to be partly fleshy and partly tendinous; fleshy inferiorly, becoming tendinous in their ascent. The muscular slips generally extend over the first, to be inserted into the second vertebra, occasionally over two, into the third vertebra. The function of this muscle is to inflect the spine laterad; both muscles inflecting the spine dorsad.

The quadratus lumborum muscle* c, seen in Plate VI., and in Part II., Plate V., is situated in the lumbar region of the abdominal cavity, between the transversalis abdominis, and the psoas magnus muscles. In this Plate VI., the quadratus c is observed laterad to the multifidus spinæ muscle q, and to derive its origin from the posterior or dorsal third of the crista s of the os ilium, to ascend with oblique fibres, which are inserted into the transverse processes of the lumbar vertebræ, the side of the body of the last dorsal vertebra, and the contiguous part of the last rib. This muscle is covered posteriorly or dorsad by the fascia lumborum, and anteriorly or towards the abdominal cavity, by the peritoneum, as illustrated in Part II. The muscle is thick and fleshy, with occasionally tendinous striæ parallel to its carneous fibres. The function of the quadratus lumborum is to inflect the spine laterad, to pull down the last rib, and consequently to act on the diaphragm in inspiration; when both muscles act, they inflect the spine sternad and pubic; when the spine and ribs are fixed, this muscle will aid in elevating the pelvis to the thorax.

Continuous with the sacro-lumbalis muscle D, d, Plates VI. and VII., atlantad in the neck, is the cervicalis des-

* Nonus et decimus dorsum moventium. Primus dorsi musculus. Sexti paris dorsi. Quadratus. Paris lumborum quadrati. Flectens par lumborum quadratus dorsi. Le quarré ou carré des lombes, ou lombaire externe. Lumbaris externus. Ilio-costal. Ilio-lumbi-costal.

cendens ɣ muscle*, which is properly a continuation of the former. On the left side, in Plate VI., this muscle is obscured by the serratus superior posticus E, and the splenius *p*, p; while on the right side, merely by the splenius: the sacro-lumbalis d is truncated immediately below or sacrad to the third superior or atlantal rib. The cervicalis descendens is described as deriving an origin from the four or five superior ribs, and ascending to be inserted into the transverse processes of the fourth, fifth, and sixth cervical vertebræ. This muscle assists in rotating the lower or sacral cervical vertebræ on each other, in inflecting laterad and dorsad the neck, and in elevating the ribs in active inspiration.

The longissimus dorsi muscle K, k, of Plate VI., has a continuation atlantad in the neck, similar to the sacro-lumbalis, which is named the transversalis colli ƙ †; this appendage is concealed on the left side by the serratus superior posticus E, and the splenius *p*, p, muscles, while on the right side only by the splenius *p*, p, so that its commencement is observable. In Plate VII., on the right side, the transversalis muscle ƙ is seen on the mesial aspect of the cervicalis descendens ɣ, and laterad to the complexus o and trachelo mastoideus F muscles. It is described as deriving an origin from the transverse processes of the five superior dorsal vertebræ, and ascending obliquely atlantad, to be inserted into the transverse pro-

* Syn. Secundi paris dorsi musculorum secundum principium a costa. Pars superior cervicalis descendentis. Sacro-lumbalis pars superior. Sacro-lumbi ea superior pars, quam Diemerbrockius cervicalem descendentem musculum vocat. Le transversaire grêle, ou transversaire coliatéral du col. Le dorso-trachélien du muscle sacro-spinal. Le costo-trachélien du lumbo-costo trachélien.

† Quintus et sextus dorsum moventium. Tertius cervicis musculus. Secundi paris dorsi musculorum principium prius. Transversarius. Transversalis. Transversalis cervicis. Le grand transversaire du cou. L'accessoire du long dorsal.

cesses of the five or six inferior cervical vertebræ. This muscle assists the cervicalis descendens in rotating the cervical vertebræ on each other, and in inflecting the neck laterad and dorsad.

In Plate VII., on the mesial aspect of the transversalis colli muscle ⁎, and the lateral aspect of the complexus muscle o, or between these muscles, the trachelo-mastoideus F,* a thin slender muscle, is situated, deriving its origin from the transverse processes of the three or four superior dorsal, and the five inferior cervical vertebræ, ascending in the neck, to be inserted into the mastoid process *m* of the temporal bone, beneath the splenius capitis. The action of this muscle is to inflect the head laterad; and when the head is fixed, to assist in elevating the trunk towards the former.

The complexus muscle o †, is situated nearer the mesial line than the trachelo-mastoideus, and is a much bolder muscle; and in Plate VI., is observed to be almost entirely concealed by the splenius muscle p. This muscle derives its origin from the transverse processes of the six or seven superior dorsal, and the four or five inferior cervical vertebræ, and ascends to be inserted into the occipital bone between the two transverse ridges. The origin of the complexus lies first between the semi-spinalis colli N, and the longissimus dorsi k, muscles, and secondly, between the

* Syn. Secundi paris caput moventium musculus tertius. Pars secundi musculi capitis. Tertius movens caput. Pars complexi. Tertius musculus trigemini aut compositi. Trachelo-mastoideus, seu capitis par tertium. Le petit complexus ou mastoïdien latéral. Une portion du sacro-lombaire. Trachélo-mastoïdien.

† Syn. Secundi paris caput moventium, quartus musculus moles carnea. Pars secundi musculi capitis. Secundi moventis caput. Complexus aut biventer cervicis. Pars complexi. Carnea quædam moles quæ trigemino adjungitur. Pars ejus qui le complexus. Biventer cervicis et complexus. Complexus major. Trachélo-occipital. Dorsi-trachélo-occipital. Le grand complexus.

semi-spinalis colli N and the trachelo-mastoideus F. When dissecting these muscles, we should endeavour to reach as soon as possible some well defined portion, as, for example, the insertion of the complexus, and trace it to the origin, otherwise we shall frequently amalgamate one muscle with another. The complexus in its progress has generally one or two tendinous intersections, running either obliquely across, or parallel with the carneous fibres, and the insertion occupies a great extent of the occipital bone in breadth; so that from these appearances, the muscle must be frequently called into action in inflecting dorsad the head, and in giving support to the head when stooping or standing erect. In the event of the head being fixed, the complexus will assist in approximating the trunk.

When the complexus muscle o is detached from its insertion into the occipital bone and reflected, the two obliique muscles B, E, and the two recti muscles A, P, appear.

The musculus obliquus capitis superior B,* situated beneath the complexus muscle o, and close to the posterior or inial surfaces of the temporal bone 7, and the occipital 5, derives its origin from the projecting transverse process *d* of the atlas, ascends obliquely backwards or iniad, running close upon the cranium, to be inserted into the occipital bone 5, immediately beneath the inferior of the two transverse ridges; see Part I., Plate V., *Fig.* 5. Both the origin and insertion of this muscle are tendinous,

* Syn. Quinti paris caput moventium. Sextus caput movens. Sextus capitis. Obliquus musculus qui retro à transverso primæ vertebræ processu in caput inseritur. Obliquus minor. Paris obliqui superioris. Obliquus superior. L'oblique supérieur ou petit oblique. Atloïdo-sous-mastoïdien. Trachélo-atloïdo-occipital.

indeed the whole muscle is so tendinous as to resemble in some measure a ligamentous expanse on the cranium. The insertion conceals that of the rectus major A, and in some degree that of the minor P.

The function of the obliquus superior, is to inflect the head dorsad or backwards; when the head is the fixed point, it will inflect the atlas, and assist in inflecting the spine also backwards or iniad to the head; but these latter actions are seldom performed.

The musculus obliquus inferior capitis E,* situated beneath the complexus muscle o, and extending between the two superior cervical vertebræ, derives its origin from the spinous process *e* of the vertebra dentata, and ascends obliquely outwards to be inserted into the transverse process *d* of the atlas. This muscle is more fleshy, thicker and stronger than the superior oblique, and there are few or no tendinous fibres, excepting at the origin. This muscle rotates the atlas on the dentata, and, when both muscles act, assists in inflecting the head backwards.

The musculus rectus capitis posticus major A†, situated beneath the complexus muscle o, and in the angle formed by the two oblique muscles, derives its origin from the spinous process *e* of the vertebra dentata, and ascends with less obliquity of fibre than the obliquus inferior, to be inserted into the occipital bone 5, basilad to the inferior of the two transverse ridges, and the obliquus superior

* Syn. Obliquus inferior capitis. Sexti paris caput moventium. Quintus caput movens. Septimus capitis. Parvus musculus a secundæ vertebræ spina in processum transversum primæ oblique infixus. Obliquus major. Paris obliqui inferioris. Obliquus inferior. Le grand oblique. Oblique inferior, ou axoïdo-atloïdien. Spini-axoïdo-tracheli-atloïdien.

† Syn. Tertii paris caput moventium. Tertius musculus caput movens. Major rectus. Rectus major. Le grand droit postérieur de la tête. Axoïdo-occipital. Spini-axoïdo-occipital.

muscle B. The origin of this muscle is fleshy, and its fibres radiate to their insertion which is partly tendinous.

The function of the rectus capitis major is to inflect the head dorsad, and to rotate it on the vertebra dentata through the medium of the atlas.

The musculus rectus capitis posticus minor P,* is situated beneath the obliquus superior B and rectus capitis major A muscles. In the drawing, the head is turned a little to the left side, to bring these muscles more distinctly into view. The rectus minor P derives its origin acutely from the spinous process *e* of the atlas, ascends with radiating fibres to be inserted into the occipital bone 5, basilad to the inferior of the two transverse ridges and the obliquus superior B and rectus major A muscles. Both the origin and the insertion of the rectus minor are tendinous, and the fibres scattered.

The musculus rectus capitis lateralis H, † situated deeply beneath the several muscles connected to the mastoid process *m* of the temporal bone 7, derives its origin from the transverse process *d* of the atlas, and is inserted into the ridge of the occipital bone which extends between the mastoid process *m* of the temporal bone, and the foramen magnum of the occipital bone: for the more minute insertion of this muscle, consult Part I., Plate V., *Fig.* 5, letter *f*. This muscle inflects the head slightly laterad and dorsad.

* Syn. Quarti paris caput moventium. Quartus musculus caput movens. Rectus minor. Le petit droit postérieur de la tête. Atloïdo-occipital. Tuber-atloïdo-occipital.

† Syn. Musculus admodum parvus, qui a processu transverso primæ vertebræ ortus. Alter musculus prædictis brevior et angustior. Musculus obliquus, qui ante a transverso primæ vertebræ processu in caput inseritur. Rectus lateralis. Le rengorgeur droit. Le premier transversaire anterieur.

The musculi interspinales, letters g,* situated between the spinous processes of the contiguous vertebræ, arise from the one spinous process *e* of a vertebra, and are inserted into the spinous process *e* of the next vertebra. In the neck, they form distinct pairs of fleshy muscles, while in the back and loins they become more and more ligamentous, as observed in Plates VII. and V: in the latter Plate they are seen to be ligaments lying superficially between the spinous processes of the lumbar vertebræ.

The musculi intertransversales, letters *h*,† Plate VI., are short muscular slips extending between the transverse processes of the vertebræ; double in the neck, very slender in the back, and thick and fleshy in the loins. They approximate the vertebræ in the lateral inflections of the spine.

In this Plate VII. the intertransverse‡ ligaments are represented, marked with the digits 1; and, as their name indicates, extend from the one transverse process of a vertebra to the other. One of the ligaments of the necks of the ribs, marked 2, is observed beneath or sternad to the atlantal of these two intertransverse ligaments, extending nearly in the same direction; these are named ligamenta interna colli costarum,§ and descend from

* Syn. Interspinales colli; interspinales dorsi; interspinales lumborum. Les épineux des lombes; les épineux du dos; les petits épineux du col. Interspinales. Supernumerarii. Musculus superspinalis colli. Inter-épineux du cou. Les inter-cervicaux.

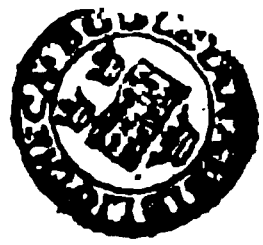
† Intertransversarii priores et posteriores colli, dorsi et lumborum. Les petits transversaires ou intertransversaires du cou, du dos et des lombes. Intertransverse priores et posteriores. Inter-trachéliens.

‡ Syn. Ligamenta processuum transversarum vertebrarum. Ligamenta intertransversalia.

§ Syn. Ligamenta transversa interna costarum.

the transverse processes of the dorsal vertebræ, to be attached to the superior or atlantal surface of the necks of the ribs. The capsular* ligaments of the tubercles of the ribs are marked *l*, and are seen surrounding the articulations between the transverse processes of the dorsal vertebræ, and the articular surfaces contiguous to the tubercles of the ribs. These capsules, like those of other joints, have strong ligamentous bands exteriorly to strengthen them, which by some authors are described as separate ligaments, and named ligamenta transversa externa costarum.

* Syn. Ligamenta capsularia capitulorum minorum.



INDEX

OF

THE LETTERS OF REFERENCE

IN

PART IV.

THE MUSCLES OF THE TRUNK.

PLATE I.

B, Paupart's ligament
C, Situated near serratus magnus muscle O, is the pectoralis major muscle
C, Situated near crista S of os ilium, is the anterior superior spinous process of os ilium
D, Pubic portion of fascia lata
E, Latissimus dorsi muscle
F, Origins of external oblique muscle of abdomen
K, Iliac portion of fascia lata
O, Serratus major anticus muscle
R, Rectus abdominis muscle
S, Crista of os ilium
T, Pyramidalis muscle
U, Umbilicus

a, Cremaster muscle
f, Linea semi-lunaris
r, Tendinous intersections of rectus muscle

b, Saphena major vein
f, Linea alba

1, Upper pillar of external aperture of inguinal canal
2, Lower pillar of external aperture of inguinal canal
70, Suspensory ligament of penis

PLATE II.

A, Ribs
C, Anterior superior spinous process of os ilium
D, Pubic portion of fascia lata
G, Internal oblique muscle
K, Iliac portion of fascia lata
R, Rectus abdominis muscle
S, Crista of os ilium
U, Umbilicus
X, Internal intercostal muscles
Z, External intercostal muscles

a, Cremaster muscle
f, Tendon of external oblique muscle
g, Anterior tendon of internal oblique muscle
x, Epigastric artery

a, Peritoneum
f, Linea alba
g, Posterior tendon of internal oblique muscle
x, Epigastric vein

t, Spine of os pubis

3, Gimbernat's ligament
14, Internal mammary artery

PLATE III.

A, Ribs
C, Anterior superior spinous process of os ilium
D, Pubic portion of fascia lata
G, Internal oblique muscle
I, Transversalis muscle
K, Iliac portion of fascia lata
S, Crista of os ilium
U, Umbilicus
V, Vas deferens
X, Internal intercostal muscles

a, Cremaster muscle
f, Tendon of external oblique muscle
g, Anterior tendon of internal oblique muscle
i, Tendon of transversalis muscle
x, Epigastric artery

a, Peritoneum
c, Circumflex iliac artery
f, Linea alba
g, Contiguous to letters i, is the posterior tendon of internal oblique muscle
g, Contiguous to v, is the spermatic cord
x, Epigastric vein

t, Spine of os pubis
y, Linea-ilio-pectinea

PLATE IV.

A, Ribs
B, Diaphragm
C, Quadratus lumborum muscle
C, Renal arteries truncated
D, Ligamentum arcuatum
I, Œsophagus
K, Psoas magnus muscle
P, Common iliac artery
R, Superior mesenteric artery

b, Origins of crura of diaphragm
e, Aorta abdominalis
n, Cœliac artery

e, Sternum
i, Vena cava ascendens

PLATE V.

B, Deltoid muscle
C, Base of scapula
D, Acromion scapulæ
E, Contiguous to skull, is the sterno-cleido-mastoideus muscle
E, Situated in lower half of Plate, indicates latissimus dorsi muscle
F, Placed on scapula, is teres major muscle
F, Contiguous to crista, s, of os ilium, is external oblique muscle
G, Internal oblique muscle
H, Serratus posticus inferior muscle
O, Complexus muscle
S, Crista of os ilium
T, Rhomboideus major muscle
U, Omo-hyoideus muscle

d, Tendons of sacro-lumbalis muscle
g, Interspinous ligament
k, Tendons of longissimus dorsi muscle
p, Splenius capitis muscle
q, Occipito-frontalis muscle
t, Rhomboideus minor muscle

a, Protuberance of occipital bone
c, Base of scapula
e, Spinous process of vertebra
h, Spine of scapula
p, Splenius colli muscle

b, Superior transverse ridge of occipital bone
c, Base of scapula

40, Levator scapulæ muscle
66, Supra-spinatus muscle
80, Trapezius muscle
81, Infra-spinatus muscle

PLATE VI.

C, Quadratus lumborum muscle
D, Sacro-lumbalis muscle
E, Serratus superior posticus muscle
K, Longissimus dorsi muscle
L, Spinalis dorsi muscle
M, Semi-spinalis dorsi muscle
O, Contiguous to skull, indicates complexus muscle
O, Contiguous to left scapula, is serratus magnus muscle
Q, Multifidus spinæ muscle
S, Crista of os ilium
T, Insertion of rhomboideus major muscle
Z, External intercostal muscles

d, Tendons of sacro-lumbalis muscle
k, Tendons of longissimus dorsi muscle
p, Splenius capitis muscle
t, Insertion of rhomboideus minor muscle
z, Levator costæ muscle

a, Protuberance of occipital bone
d, Musculus accessorius ad sacro-lumbalem muscle
h, Intertransverse muscle
k, Insertion of longissimus dorsi muscle
m, Mastoid process of temporal bone
p, Splenius colli muscle

b, Superior transverse ridge of occipital bone
d, Cervicalis descendens muscle
k, Transversalis colli muscle

5, Occipital bone
9, Axillary plexus of nerves
40, Levator scapulæ muscle
50, Scalenus posticus muscle
52, Superficial cervical artery

PLATE VII.

A, Rectus capitis major muscle
B, Obliquus superior muscle
E, Obliquus inferior muscle
F, Trachelo-mastoideus muscle
H, Rectus capitis lateralis muscle
M, Semi-spinalis dorsi muscle
N, Semi-spinalis colli muscle
O, Complexus muscle
P, Rectus capitis minor muscle
d, Sacro-lumbalis muscle
g, Interspinalis muscle
k, Longissimus dorsi muscle

a, Protuberance of occipital bone
d, Transverse process of atlas
c, Spinous process of vertebra
l, Capsular ligament of tubercle of rib
m, Mastoid process of temporal bone

PLATE VII. (*Continued.*)

b, Superior transverse ridge of occipital bone
d, Cervicalis descendens muscle
k, Transversalis colli muscle

1, Intertransverse ligament
2, Internal ligament of neck of rib
5, Occipital bone
7, Temporal bone

NOTICE.

THE distinguished success, evinced by the extensive and daily increasing Sale which the Author's SYSTEM OF ANATOMICAL PLATES has experienced, and the flattering manner in which it has been noticed in every Medical Journal of Britain, together with the numerous private testimonies in its favour which he has had the honour of receiving from the heads of the Medical Schools of London, Edinburgh, Glasgow, and Dublin, from the eminent individuals who preside over the Army and Navy Medical Boards, and from several men of science and reputation on the Continent and in America,—impose it upon him as a duty to avail himself of the present opportunity of once more returning his warm and heartfelt acknowledgements for the favourable and gratifying reception which his work has met with

from the profession at large and from the public. Fully aware that "praise undeserved is censure in disguise," the author cannot, at the same time, persuade himself, that his "System" would have called forth such unanimous approbation, and been zealously patronized by the masters of his own profession, had it been destitute of the peculiar merits to which it lays claim, or had it not been well calculated to supply a desideratum, which has long been felt and acknowledged, particularly of late. Under this impression, his most anxious efforts will be devoted to the part of his task which still remains unaccomplished, and which, stimulated by the high and general approbation already given to his labours, he trusts he shall be able to perform in such a manner as to prove himself not unworthy of that favour and patronage which have already been so liberally and honourably bestowed on him.

But while he thus disburthens himself of the acknowledgements which are due to the profession and the public in general, he is, at the same time, desirous, in a particular manner, to record the obligations which he owes to Sir Astley Cooper, Baronet, Surgeon to the King, for the highly gratifying

notice which that eminent individual has been pleased to take of his labours, and the interest he has manifested for their success among that profession of which he is one of the most distinguished ornaments. To that justly celebrated man, the author and the public are indebted for the two Supplemental Plates to Part IV. of this work, displaying the Surgical Anatomy of Inguinal and Crural Hernia, and engraved from drawings taken from a dissection made by Sir Astley's own hands. The preparation itself was kindly presented to the author with permission to embody representations of it in his work, and is now deposited in the Museum attached to his Class. It would be worse than vanity were the author to attempt to conceal the honest pride he feels in recording so flattering a mark of friendship on the part of this great master of Surgery; and he is confident that the members of his own profession will agree with him in considering the contribution of Sir Astley as imparting a great additional interest to his work.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.E.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART V.—MUSCLES AND JOINTS OF THE UPPER AND LOWER EXTREMITIES.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, LONDON; AND

HODGES AND M'ARTHUR, DUBLIN.

1824.

EDINBURGH:
Printed by John Brewster,
11, Society.

TO

SIR JAMES M'GRIGOR,

DIRECTOR GENERAL OF THE MEDICAL DEPARTMENT OF THE ARMY,

UNDER WHOSE HAPPY AUSPICES

THAT BRANCH OF THE PUBLIC SERVICE HAS ATTAINED

ITS PRESENT EMINENCE FOR

PROFESSIONAL LEARNING AND SCIENCE;

THIS PART IS RESPECTFULLY INSCRIBED,

BY

HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART V.

MUSCLES AND JOINTS

OF THE

UPPER AND LOWER EXTREMITIES.

CONTENTS.

Page

Muscles of the Upper Extremity, - - 45

Greater Pectoral Muscle, (Pls. VIII. and IX. figs. 1 and 2 of Part V., and Pl. XI. fig. 1 of Part III., letters C, *c*,) - - - - - - 45

Lesser Pectoral Muscle, (Pls. VIII. and IX. fig. 1, letters D, *d*,) - - - - - - 47

Subclavius Muscle, (Pl. VIII. letter M,) - - 48

Serratus Major Anticus Muscle, (Pl. VIII. of Part V., and Pl. VI. of Part IV. letters O,) - - - 50

Deltoid Muscle, (Pls. VIII. and IX. figs. 1 and 2 of Part V., and Pls. XI. and XII. figs. 1 of Part III., letters B, b,) 51

Biceps Muscle, (Pls. VIII. IX. and X. of Part V., and in Pls. XI. and XII. figs. 1 of Part III., letters L, *l*, l, λ, l,) - - - - - 53

Coraco-brachialis Muscle, (Pls. VIII. and IX. of Part V., and in Pl. XI. fig. 1 of Part III., letters K,) - 54

Brachieus Internus Muscle, (Pl. IX. fig. 1, X. and XI. figs. 1 and 2 of Part V., also Pl. XII. fig. 1 of Part III., letters M, m,) - - - - - 55

Triceps Muscle, (Pls. VIII. and IX. of Part V., and Pls. XI. and XII. figs. 1 of Part III., letters G, g, *g*,) - 56

Anconeus Muscle, (Pl. XII. figs. 1 and 2, letters E,) - 58

Teres Major Muscle, (Pl. VIII. of Part V., Pl. V. of Part IV., Pls. XI. and XII. figs. 1 of Part III., letters F,) - 59

Teres Minor Muscle, (Pl. XII. fig. 1 of Part III. digits 80,) 60

Infra-spinatus Muscle, (Pl. XII. fig. 1 of Part III., Pl. V. of Part IV., and Plate IX. fig. 1 of Part V., digits 81,) - - - - - 61

Supra-spinatus Muscle, (Pl. XII. fig. 1 of Part III., Pl. V. of Part IV., and Pl. IX. fig. 1 of Part V., digits 66,) 62

Subscapularis Muscle, (Pls. VIII. and IX. figs. 1 and 2, letters I, i, *i*,) - - - - 62

Muscles of the Fore-Arm, - - 67

Pronator Radii Teres Muscle, (Pls. X. and IX. fig. 1 of Part V., and Pl. XI. fig. 2 of Part III., letters I,) 68

Page

Pronator Quadratus Muscle, (Pls. X. and XI. figs. 1 and 2 of Part V., and Pl. XII. fig. 2 of Part III. digits 50,) 70
Supinator Radii Longus Muscle, (Pls. IX. X. XI. and XII. figs. 1 of Part V., also in Pls. XI. and XII. figs. 2 of Part III., letters N,) - - - - 70
Supinator Radii Brevis Muscle, (Pls. X. and XI. fig. 1, and Pl. XII. fig. 2, digits 55,) - - - 71
Flexor Carpi Radialis Muscle, (Pls. X. and IX. fig. 1, and Pl. XI. figs. 1 and 2 of Part V., also in Plate XI. fig. 2 of Part III., letters P,) - - - 73
Flexor Carpi Ulnaris Muscle, (Pls. X. and XI. fig. 1 of Part V., and in Pls. XI. and XII. figs. 2 of Part III., letters S,) - - - - - 74
Extensor Carpi Ulnaris Muscle, (Pl. XII. figs. 1 and 2 of Part V., and Pl. XIII. of Part III., letters B,) - 75
Extensor Carpi Radialis Longior Muscle, (Pl. XII. figs. 1 and 2, letters H,) - - - - 75
Extensor Carpi Radialis Brevior Muscle, (Pl. XII. figs. 1 and 2, letters *h*,) - - - - 76
Palmaris Longus Muscle, (Pl. X. of Part V., and Pl. XI. fig 2, Part III., letters Q,) - - - 77
Palmaris Brevis Muscle, (Pl. X., digits 54,) - - 79
Flexor Digitorum Sublimis, (Pls. X. and XI. fig. 1 of Part V., and in Pls. XI. and XII. figs. 2 of Part III., letters R, r, *r*,) - - - - - 79
Flexor Digitorum Profundus, (Pls. X. and XI. fig. 1 of Part V., and in Pl. XII. fig. 2 of Part III., letters W, w,) 81
Lumbricales Muscles, (Pl. X., and Pl. XI. fig. 1, letters ŵ,) - - - - - 82
Extensor Communis Digitorum, (Pl. XII. fig. 1 of Part V., and in Pl. XIII. of Part III., letters D, d, *d*,) - 83

Muscles of the Thumb, - - 94
Abductor Pollicis Manus, (Pl. X. of Part V., and in Plate XI. fig. 2 of Part III., letter Y,) - - 94
Adductor Pollicis Manus, (Pls. X. and XI. fig. 1 of Part V., also in Plate XII. fig. 2 of Part III., letter *w*,) - 95
Flexor Ossis Metacarpi Pollicis, (Pls. X. and XI. fig. 1 of Part V., also in Plate XII. fig. 2 of Part III. digits 52,) - - - - - - 96
Flexor Brevis Pollicis, (Pls. X. and XI. fig. 1 of Part V., also in Pls. XI. and XII. figs. 2 of Part III., letters Z, *z*,) - - - - - - 96
Flexor Longus Pollicis, (Pls. X. and XI. fig. 1 of Part V., also in Pl. XII. fig. 2 of Part III., letters X,) - 97
Extensor Ossis Metacarpi Pollicis, (Pl. XII. figs. 1 and 2 of Part V., also in Pl. XIII. of Part III. letters *a*,) 98

Page

Extensor Primi Internodii Pollicis, (Pl. XII. figs. 1 and 2 of Part V., also in Pl. XIII. of Part III., letters *b*,) 99
Extensor Secundi Internodii Pollicis, (Pl. XII. figs. 1 and 2 of Part V., also in Plate XIII. of Part III., letters *c*,) 100

Muscles of the Fore-Finger, - - 103
Indicator Muscle, (Pl. XII. fig. 2, letters *f*,) - - 103
Abductor Indicis Muscle, (Pls. XII. and XI. fig. 1, and in Pl. X. digits 70,) - - - - 104

Muscles of the Little Finger, - - 104
Flexor Parvus Digiti Minimi, (Pls. X. and XI. fig. 1 of Part V., and in Pl. XII. fig. 2 of Part III., digits 52, near 55,) - - - - - - 105
Abductor Digiti Minimi, (Pls. X. and XI. fig. 1 of Part V., and in Plate XII. fig. 2 of Part III., digits 51,) - 105
Adductor Digiti Minimi, (Pl. X., and Pl. XI. fig. 1, digits 55,) 106

Muscles of the Fingers, - - - 106
Interossei Externi Muscles, (Pl. XII. figs. 1 and 2, letters *m*, *n*, o,) - - - - - 106
Prior Medii Muscle, (Pl. XII. figs. 1 and 2, letter *m*,) - 107
Posterior Medii Muscle, (Pl. XII. figs. 1 and 2, letter *n*,) 107
Posterior Annularis, (Pl. XII. figs. 1 and 2, letter *o*,) - 107
Interossei Interni Muscles, (Pl. XI. fig. 2, letters *p*, *q*, *s*, *t*,) 108
Prior Indicis Muscle, (Pl. XI. fig. 2, letter *p*,) - - 108
Posterior Indicis Muscle, (Pl. XI. fig. 2, letter *q*,) - - 108
Prior Annularis Muscle, (Pl. XI. fig. 2, letter *s*,) - - 109
Interosseous Auricularis, (Pl. XI. fig. 2, letter *t*,) - - 109

Muscles of the Lower Extremity, - - 111
Tensor Vaginæ Femoris, (Pls. XV. XVI. of Part III., Pl. XIII. of Part V., and Pl. XVI. of Part VI., letters K,) - - - - - 114
Sartorius Muscle, (Pls. XV. XVI. XVII. and XX. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XX. fig. 1 of Part VI., letters E,) - - - 115
Gracilis Muscle, (Pls. XVI. XVII. and XX. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XX. of Part VI. letters Q,) - - - - 116
Triceps Muscle, (Pls. XVI. and XVII. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XVI. of Part VI., letters G, g, *g*,) - - - - 117
Adductor Longus, (Pls. XVI. and XVII. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XVI. of Part VI., letter g,) - - - - 117
Adductor Brevis, (Pls. XVI. and XVII. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XVI. of Part VI., letter *g*,) - - - - 118

Page

Adductor Magnus, (Pls. XVI. and XVII. of Part III., Pls. XIII. and XIV. of Part V., and Pl. XVI. of Part VI., letter G,) - - - 119
Pectinalis Muscle, (Pl. XVI. of Part III., Pls. XIII. and XIV. of Part V., letter P, near g,) - - 119
Psoas Parvus Muscle, (Pl. V. of Part II. letter M,) - 120
Psoas Magnus Muscle, (Pls. V. and VI. of Part II., Pl. IV. of Part IV. and Pl. XIII. of Part V., letters K,) - 121
Iliacus Internus Muscle, (Pls. XIII. and XIV. of Part V., Pl. XVI. of Part III., and Pls. V. and VI. of Part II. letters W,) - - - - 122
Rectus Femoris Muscle, (Pl. XVI. of Part III., Pls. XIII. and XIV. of Part V., letters I, near P and L,) - 123
Vastus Internus Muscle, (Pl. XVI. of Part III., Pls. XIII. and XIV. of Part V., letter J,) - - - 124
Vastus Externus Muscle, (Pl. XVI. of Part III., letter O,) 125
Crureus Muscle, (Pl. XVI. of Part III., Pls. XIII. and XIV. of Part V., letter P, between L and O,) - 125

Ligaments of the Upper Extremity.

Ligaments of the Sternum, (Pl. VIII. letter *e*,) - - 49
Capsular Ligament of Sternal Articulation of Cartilage of Rib, (Pl. VIII. digit 3,) - - - 49
Capsular Ligament of Sternal Extremity of Clavicle, (Pl. VIII. and Pl. IX., fig. 3, digit 1,) - - - 49
Interarticular Cartilage of Sternal Articulation of Clavicle, (Pl. VIII., digit 2,) - - - - 50
Interclavicular Ligament, (Pl. IX., fig. 3, digit 7,) - 50
Rhomboid Ligament, (Pl. IX. fig. 3, dig. 10,) - - 49
Ligamentous Expanse between Clavicle and Scapula, (Pl. VIII. digit 4,) - - - - 49
Conoid and Trapezoid Ligaments, (Pl. IX. figs. 1 and 2, digit 8,) - - - - - 66
Capsular Ligament of Scapulary Extremity of Clavicle, Pl. IX. fig. 1, digit 9,) - - - - - 67
Proper Anterior Ligament of Scapula, (Pl. IX. figs. 1 and 2, digit 6,) - - - - - - 64
Proper Posterior Ligament of Scapula, (Pl. IX. fig. 2 of Part V., and in Pl. XII. fig. 1 of Part III., letter *a*,) 67
Capsular Ligament of the Shoulder-Joint, (Pl. VIII., and Pl. IX. fig. 2, letter *c*,) - - - 64
Radial Intermuscular Ligament, (Pl. XII. figs. 1 and 2, digits 25,) - - - - - 84
Ulnar Intermuscular Ligament, (Pl. XI. fig. 2, digit 28,) 84
Ligaments of the Elbow-Joint, - - - 85
Radial Lateral Ligament, (Pl. XI. fig. 2, digits 45,) - 85

Page

Ulnar Lateral Ligament, (Pl. XI. fig. 2, digits 40,) - 85
Capsular Ligament of Elbow-joint, (Pl. XI. figs. 2 and 3, and Pl. XII. fig. 2, digits 35,) - - - 86
Oblique Ligament, (Pl. XI. fig. 2, digits 60,) - - 89
Interosseous Ligament, (Pl. XI. fig. 2, digits 61,) - 89
Annular Ligament, (Pl. X., Pl. XI. fig. 1, Pl. XII. figs. 1 and 2 of Part V., also in Pl. XII. fig. 2, and Pl. XIII. of Part III. letters u,) - - - 90
Sacciform Ligament, (Pl. XI. figs. 2 and 4, digits 62,) - 91
Ligaments of the Wrist-Joint, - - - - 91
Ulnar Lateral Ligament, (Pl. XI. figs. 2 and 4, digits 64,) 91
Radial Lateral Ligament, (Pl. XI. figs. 2 and 4, digits 65,) 92
Capsular Ligament, (Pl. XI. figs. 2 and 4, digits 63,) - 92
Ligaments of the Carpal Bones, - - - 110
Intertransverse Ligaments, (Pl. XI. figs. 2 and 4, Pl. XII. fig. 2, marked thus *,) - - - - 110
Capsular Ligaments, (Pl. XI. figs. 2 and 4, also Pl. XII. fig. 2, marked thus *,) - - - 110
Intertransverse Ligaments between Carpal and Metacarpal Bones, (Pl. XII. fig. 2, marked thus *,) - - 111
Capsular Ligaments, between Carpal and Metacarpal Bones, (Pl. XII. fig. 2, marked thus *,) - - 111
Ligaments of the Thumb, - - - - 101
Capsular Ligament of Metacarpal Articulation with Os Trapezium, (Pl. XI. figs. 2 and 4, letters *g*,) - 101
Capsular Ligament of Articulation between the Metacarpal Bone and Proximal Phalanx, (Pl. XI. fig. 2, letter *e*,) 102
Lateral Ligament of this Joint, (Pl. XI. fig. 2, letter *k*,) 102
Capsular Ligament of Distal Joint, (Pl. XI. fig. 2, letter *m*,) 103
Lateral Ligament of Distal Joint, (Pl. XI. fig. 2, letter *n*,) 103
Ligaments of Fingers, - - - - - 102
Vaginal Ligaments of Flexor Tendons, (Pl. X., and Pl. XI. figs. 1 and 2, digits 30,) - - - - 81
Intertransverse Ligaments, between heads of Metacarpal Bones, (Pl. XI. fig. 1, digits 34,) - - 81
Capsular Ligaments of Proximal Joints, (Pl. XI. fig. 2, letters *e*,) - - - - - - - 102
Lateral Ligaments of Proximal Joints, (Pl. XI. fig. 2, letters *k*,) - - - - - - - 102

Ligaments of Lower Extremity.

Fascia Lata, (Pl. XV. of Part III., Pls. I. II. and III. of Part IV., letters K, D,) - - - 112

Page

Surgical Observations.

Description of the Operation for the Extirpation of Cancerous Mamma, - - - - 46
Description of the Operation for Diseased Axillary Glands, 47
Luxation of the Sternal Extremity of the Clavicle, with treatment, - - - - 50
Diseases of Bursa Mucosa beneath Deltoid Muscle, - 52
Description of Amputation of the Arm, - - 57
Luxation of Shoulder-Joint, with treatment, - - 64
Luxation of Scapulary Extremity of Clavicle, with treatment, 67
Inflammation and Suppuration of Fascia Palmaris, - 78
Contracted Tendons of Flexor Muscles of Fingers, - 81
Luxation of Elbow-Joint, with treatment, - - 86
Amputation of Fore-Arm, - - - - 89
Sprains of Muscles in Contiguity of Wrist-Joint, - 90
Luxation of Distal Extremity of Ulna, with treatment, - 91
Luxation of Distal Extremity of Radius, with treatment, - 92
Luxation of Wrist-Joint, with treatment, - - - 93
Luxation of Individual Carpal Bones, - - - 110
Luxation of Metacarpal Bone of Thumb, with treatment, - 101
Luxation of Joints of Fingers, with treatment, - - 102
Amputation at the Joints of the Fingers, - - - 108
Psoas or Lumbar Abscess, with treatment, - - 121

SUPPLEMENT

TO

PART IV.

In the two Supplemental Plates to this Part, we have correct representations of a dissection of inguinal and crural hernia, by Sir Astley Cooper.

In Plate I. the parts are most clearly elucidated, and display a neatness of manipulation seldom equalled. The letters f indicate the tendinous expanse of the external oblique muscle, part of which is cut nearly parallel with Paupart's ligament B, and reflected to bring into view the internal oblique muscle G, the transversalis muscle I, with its tendon i, together with the outer *i*, and inner ί, portions of the fascia transversalis; the former of which, or iliac *i*, ascends behind the transversalis muscle to the diaphragm, while the latter or inner or pubic portion ί descends beneath, or sacrad to Paupart's ligament, to form the sheath of the femoral vessels: these are represented as shining through the sheath; the artery being marked T, and the vein U. The internal oblique muscle G, and transversalis muscle I, are also divided from their attachment with Paupart's ligament B, and reflected. The spermatic cord *a* is seen descending through the aperture of the fascia transversalis formed by its iliac *i*, and pubic ί, portions, which thus constitute the internal aperture of the inguinal canal; then between the inter-

nal G, and external f oblique muscles, receiving the delicate muscular fibres of the cremaster muscle a, and emerging at the external aperture 1, 2, of the inguinal canal. In Plate II. the spermatic cord, consisting of its arteries *g*, *g*, its veins, g, g, and its duct or vas deferens v, is observed to emerge from the abdomen at the internal aperture, marked *i*, *i*, of the inguinal canal, on the iliac side of the epigastric artery x. The margin of the aperture on this abdominal aspect, is lined with the peritoneum *a*, which is also seen to invest the transversalis muscle I, with its fascia *i*, *i*, the rectus muscle R, and the epigastric artery x, with its vein *x*.

In Plate II. the iliacus internus muscle W is covered with its tendinous aponeurosis, named fascia iliaca, which unites with the transversalis muscle I, and its fascia, *i*, *i*, so as to shut up the abdominal cavity. A cellular sheath invests the external iliac artery T, and its vein U, which, as they emerge from the abdomen beneath Paupart's ligament B, as observed in Plate I., acquire an adventitious covering from the fascia iliaca and fascia transversalis, particularly from the inner or pubic portion of the latter. In Plate II., on the pubic aspect of the external iliac vein, a dark shade, marked Y, is perceived, which is the internal or abdominal aspect of the crural aperture, that appears almost completely shut up by Gimbernat's ligament 3, in Plate I., so that the protruded viscera might descend in the sheath of the blood-vessels.

THE

MUSCLES

OF THE

UPPER EXTREMITY.

PLATES VIII. IX.

THE musculus pectoralis major,* letters c, *c*, as represented in Plate VIII. of this Part, and in Plate XI., *Fig.* 1, of Part III., situated in the upper and anterior, or atlantal and sternal region of the trunk, derives its origin from the two sternal thirds of the clavicle A, the whole of the sternum *e*, and from the fifth, sixth, and seventh ribs a; and ascending obliquely across the axilla with converging fibres, is inserted into the outer or radial ridge of the bicipital groove. Where the muscle arises from the clavicle A, the fibres are strong and fleshy, and descend rather than ascend along the margin of the deltoid muscle B; these two muscles being only separated by the cephalic vein r, *Fig.* 1, Plate XI., Part III., excepting at their origins, where there is generally some cellular substance; the tendinous insertions being intimately connected. The origin from the sternum *e* becomes in its descent more and more tendinous; and at the inferior or sacral portion, the tendinous fibres interlace with those of the external oblique F

* Syn. Primus brachium moventium. Primus humeri musculus. Pectoralis. Le grand pectoral. Sterno-huméral. Sterno-costo-clavio-huméral.

of the abdomen, as represented in Plate I. of Part IV., and more or less with the greater pectoral muscle of the other side, even for some distance upwards or atlantad. The inferior or sacral fibres in their course along the axilla beautifully turn inwards to run beneath the superior or atlantal fibres, concentrating the muscle so as to enable it to be inserted by a smaller attachment than its origin: this insertion appears a double tendon. The inferior surface of the muscle is connected by loose cellular substance with the pectoralis minor, and the origins of the coraco-brachialis and the heads of the biceps. Sometimes a muscular slip extends from the pectoralis major obliquely across the axilla to the insertion of the latissimus dorsi muscle, but by no means so frequently as the reverse, see page 84 of Part III.

The function of this muscle is to throw the arm across the thorax, to elevate the arm when depressed, and to depress it when elevated; likewise to aid in pronating the hand; and also to throw the arm forwards when backwards, as in boxing. When the arm is fixed, this muscle will assist in elevating the trunk to the extremity.* The actions

* The pectoralis major muscle relates to extirpation of the mamma when attacked with cancer or fungus hæmatodes, to the removal of the axillary glands when similarly diseased, to the securing of the axillary artery when wounded or affected with aneurism in its distal portion, to amputation at the shoulder-joint, and to consecutive dislocation of this joint. When the mamma requires extirpation, the patient should be seated with the arm held at right angles to the body, and the hand slightly supinated, to throw the muscular fibres on the stretch; two semi-elliptical incisions are then to be made from the insertion to the sternal origin of the muscle, or from the region of the axilla to the sternum, the inferior or sacral being made first; these incisions should extend through the skin and cellular substance to the fascia of the muscle, and both angles or commissures should be clearly defined before proceeding further, as nothing excites more pain to the patient, or looks worse to the eye, than mangling the skin. A few sweeps of the scalpel in the same direction from above downwards will remove the gland, all of which

of these muscles of the extremities are easily understood when we know their points of attachments. In Part III., Plate XI., *Fig.* 1, this muscle is cut across to exhibit the blood-vessels and nerves beneath; and in Plate VIII. of this Part the muscle is also cut across to bring into view the pectoralis minor muscle, letters D. The origin and insertion, however, are distinctly seen, the latter being marked *c*: the insertion *c* is still more clearly delineated in Plate IX., *Figs.* 1 and 2, in both of which figures the tendon *c* is observed to be inserted on the radial or outer margin of the long tendon *l* of the biceps muscle L.

Musculus pectoralis minor, letters D, *d*,* situated beneath

should be invariably extirpated, as this is more easily effected, and there is less chance of a return of the disease. Sometimes a considerable portion of the skin, as well as the muscle, is affected, and requires removal; and hence we see the necessity of cutting in the line of the fibres of the muscle. The reason for making the incisions always from axilla to sternum, is to divide at once the root of the long mammary thoracic artery, marked a, in *Fig.* 1, Plate XI., Part III., since this thoracic branch turns round the greater pectoral muscle c; the other arteries, marked 14, branches of the internal mammary, being cut across at their roots in any direction.

When the axillary glands are diseased, the external incisions should involve them; but they should not be cut out till the removal of the mammary gland. The arm should be elevated and the hand supinated, to remove this muscle, and to render the axilla as shallow as possible. See Part III., page 84.

The manner of securing the axillary artery is detailed in Part III., page 84; as also amputation at the shoulder-joint at page 85.

When dislocation of the head of the os brachii takes place into the axilla, the great pectoral muscle gradually drags the head of the bone beneath itself, the bone of the arm resting on the ribs: this is termed consecutive luxation. The pulley apparatus will in general succeed in returning the bone to its cavity of the scapula within three months after the accident.—See Sir Astley Cooper's valuable work on Fractures and Dislocations, page 36. I have succeeded at the end of ten weeks.

* Syn. Musculus qui scapulam antrorsum agit. Primus scapulam moventium. Secundus scapulæ. Serratus minor. Serratus anticus minor. Serratus anticus. Le petit pectoral. Costo-coracoïdien.

the pectoralis major muscle, letters c, derives its origin from three of the superior ribs near their cartilages, generally the third, fourth, and fifth, sometimes, however, as in this instance, from the second, third, and fourth, by distinct digitations, which are at first tendinous, but soon become fleshy, unite and form a strong carneous mass, that again becomes tendinous immediately before its insertion into the coracoid process 5 of the scapula. The serrated origins D of this muscle intermingle with the external intercostal muscles z. The insertion *d* is incorporated with the origins of the coraco-brachialis K and short head of the biceps I muscles, seen also in Plate IX., *Fig.* 1.* The function of the lesser pectoral muscle is to pull the scapula sternad and atlantad, or forwards and upwards on the thorax; also sternad and sacrad, or forwards and downwards on the chest. When the scapula is fixed, the muscle elevates the ribs in active inspiration; and when the arm becomes elevated and fixed, this muscle will assist in bringing the thorax to the extremity.

Musculus subclavius M,† situated under the clavicle A, as its name indicates, arising tendinous and fleshy from the cartilage of the first rib, proceeds obliquely beneath the clavicle, and adheres to the bone scapulad near to the coracoid process. This muscle rotates the clavicle sternad or forwards, and in some degree sacrad or downwards. When the clavicle is fixed, it elevates the first rib, as in active respiration; but the rib ossifying at middle age onwards to the sternum, this action will only exist

* The pectoralis minor muscle has no relation to surgery, with the exception of its presenting an obstacle to the operator in his attempt to secure the axillary artery in this region, see Part III., page 84, and in being concerned in fracture of those ribs to which it is attached.

† Syn. Primus in altero latere thoracem moventium. Primus thoracis musculus. Qui sub-clavicula occultatur. Costo-claviculaire.

in early life.* A strong ligamentous expanse, marked 4, is observed extending between the clavicle A and coracoid process 5 of the scapula. Another generally embraces the subclavius muscle M. The rhomboid ligament extends between the sternal extremity of the clavicle, and the cartilage of the first rib, as represented in *Fig.* 3 of Plate IX., marked 10.

The ligaments of the sternum, and those connecting the clavicle to the sternum, are delineated in this plate on the left side. The ligamentous fibres of the sternum are observed to derive their origin from the cartilages of the ribs at their articulations, and to extend across to the right side in a radiating manner;† these obscure a few longitudinal fibres, some of which, however, are seen descending to the ensiform cartilage, which, along with those arising from the seventh rib, are named ligamentum cartilaginis ensiformis; the former being termed membrana sterni propria.‡ The articulation of one of the ribs a, to the sternum e, is laid open, which illustrates the capsular ligament 3, surrounding the smooth surface of the cartilage of the rib, and the articular depression in the side of the sternum. These ligaments are denominated ligamenta capsularia cartilaginum costarum verarum.§

A number of scattered perpendicular ligamentous fibres are observed descending from one cartilage to be inserted into the contiguous cartilage, which are named ligamenta costarum ipsarum propria.

The capsular ligament connecting the sternal extremity

* The subclavius muscle is in some degree concerned in dislocation of either extremity of the clavicle.

† Syn. Ligamenta costarum coruscantia. Radiated ligaments.

‡ Membrana ossium sterni.

§ Syn. Ligamenta cartilaginum costarum.

of the clavicle A to the sternum *e*,* is marked with the digits 1. This surrounds the smooth surfaces of both bones, and includes a cartilaginous body, marked 2, to which it adheres. In Plate IX., *Fig.* 3, this articulation is entire on both sides, and a strong ligament, marked 7, is observed extending from the one clavicle A to the other, on the atlantal and central, or upper and posterior, aspect of the sternum *e*.†

Musculus serratus major anticus, letters o,‡ situated in the lateral aspect of the thorax, derives its origin from the nine superior or atlantal ribs, by distinct fleshy digitations, which immediately unite, and form an elegant expansive muscle, that adheres to the ribs in its progress dorsad to the base of the scapula, into which it is inserted from the superior to the inferior angle. The insertion is distinctly seen in Plate VI. of Part IV., occupying the base of the scapula, between the origin of the subscapularis on the one side, and the insertions of the levator scapulæ and rhomboideus muscles on the other side.

* Syn. Ligamentum capsulare anticum claviculæ.

† The sternal extremity of the clavicle is sometimes dislocated forwards, backwards, or upwards; the first direction being the most common of this rare accident. The exposed nature of the joint at once indicates the injury, unless the patient be very fat. The shoulder is to be kept back by the clavicle bandage, with a cushion in the axilla; and a compress should be applied over the sternal extremity of the clavicle, and held there by a roller encircling the shoulders in the figure of 8. After this dislocation, the patient seldom acquires much use of the arm. In a very favourable case I kept the clavicle bandage on for four months, but still no union of the ligaments took place, so as to enable the patient to make any use of the arm. Sir Astley Cooper details a very interesting case of dislocation backwards from disease, wherein the sternal end of the clavicle so pressed upon the œsophagus, as to require to be sawn off.—See his valuable work on Fractures and Dislocations, page 401.

‡ Syn. Secundus in altero latere thoracem moventium. Secundus thoracis musculus. Serratus major. Serratus magnus. Le grand dentelé. Costo-scapulaire. Costo-basi-scapulaire.

The superior origins of this muscle are hid by the pectoralis minor, letters D, and the axillary plexus of vessels and glands. Although all the origins are connected, still a line of separation is generally perceptible onwards nearly to their insertion, and in some cases they are apart, where the superior overlaps the inferior. The function of this muscle is to pull the scapula forwards or sternad on the thorax; and according as the atlantal or the sacral fibres act individually, they elevate or depress the bone. When the scapula becomes fixed, the muscle raises the ribs to the extremity, and hence is employed in active inspiration.*

Musculus deltoides, letters B, b,† in Plates XI. and XII. *Figs.* 1, Part III., and Plates VIII. and IX., *Fig.* 1, of this Part, situated in the most prominent part of the shoulder, derives its origin from the scapulary third of the clavicle A, and from the acromion process D, and spine of the scapula; it descends over the head of the os brachii with converging fibres, to be inserted into the radial aspect of the middle of this bone. At the origin, the clavicular fibres are occasionally in some degree separated from the acromial, and the latter from those arising from the spine, which makes the muscle have the appearance of three. The clavicular fibres are more fleshy than the spinous, the latter forming a strong tendinous expanse, that is incorporated with the insertion of the trapezius 80, and which overlaps the infra-spinatus muscle 81, as represented in Plate V. of Part IV. The insertion b of the deltoid is remarkably strong, and is tendinous where it is incorporated

* The serratus major anticus muscle has no relation to surgery, excepting in fractured ribs.

† Syn. Secundus brachium moventium. Secundus humeri musculus, epomis, deltois, et humeralis. Secundus movens humerum. Elevator, attollens humerum, deltiformis. Sous-acromio-huméral. Sous-acromio-clavi-huméral.

with the greater pectoral muscle *c*, and fleshy from this radiad, being in some measure connected with the origin of the brachieus internus M, and the third head of the triceps *g*: the central or inferior surface is purely tendinous, as depicted in Plate IX., and in Part III., Plate XII., *Fig.* 1.* Where the muscle glides over the head of the os brachii, there is a large bursa mucosa, which is seen in Plate IX., *Fig.* 1, marked with the letters *a*,† formed by a membrano-tendinous expanse common to the deltoid, the infra-spinatus, the teres minor, and the biceps muscles, also to the proper anterior ligament of the scapula. The outer or spinous fibres, are connected in their course by cellular substance with the infra-spinatus, the teres minor, and the long head of the triceps; the acromial with the tendinous insertion of the supra-spinatus; and the clavicular with the heads of the biceps and the coracobrachialis.

The deltoid muscle elevates the arm either directly atlantad, or atlantad and sternad, or atlantad and dorsad, according as either the whole muscle, or its sternal or its spinous fibres are called into action. When the os brachii is fixed, this muscle aids in approximating the trunk to

* The deltoid muscle relates to amputation at the shoulder-joint, as described in Part III., page 85; and to dislocation of this joint, detailed in page 64 of this Part. When the head of the os brachii, the form of which is distinctly seen in Plate VIII., beneath the capsular ligament *c*, is forced into the axilla between the subscapularis muscle I and the long head of the triceps muscle G, there is a depression felt near the origin of the deltoid muscle from the acromion scapulæ, as will be easily understood by comparing Plates VIII. and IX. The deltoid is thrown into violent action, and elevates the arm a little from the side.

† This bursa is liable to be attacked with a superabundant secretion of mucus, with matter forming a chronic abscess, with cartilaginous substances, and with hydatids. In either of the two former cases, a small opening and bandage will generally cure the disease; but if no remedies are used, the joint becomes involved, and leads to serious consequences: in the two latter, the bursa requires a freer opening to extract or discharge these substances.

the arm; and when the individual erects himself on his hands, the deltoid preserves the equilibrium, in a similar manner as the gluteal muscles do the pelvis and trunk.

Musculus biceps flexor cubiti, letters L, *l*, l, λ, l,* delineated in Plates VIII., IX., and X., and in Part III., Plates XI., XII., *Figs.* 1, is situated on the anterior or palmar or thenal aspect of the arm, extending between the scapula and radius; derives its origin by two heads, the longer *l*, from the superior margin of the glenoid cavity of the scapula, within the capsular ligament of the shoulder-joint, as delineated in Plate IX., *Fig.* 2; the shorter head l from the coracoid process of the scapula, in conjunction with the coraco-brachialis muscle K. The shorter head l remains in connexion with the coraco-brachialis K until it joins the longer head *l*; the longer head *l* emerges from the joint, proceeds along the bicipital groove, firmly braced down by a tendinous expanse, and the greater pectoral muscle, until it approaches the point of junction with the shorter head. The two, therefore, unite at the proximal or upper third of the arm, and constitute the strong belly of the muscle, marked L, which descends along the arm to the elbow-joint, forming a long tendon λ, that runs between the supinators and extensors of the fore-arm on the one side, and the pronator radii teres and flexors on the other side, to be inserted into the tubercle of the radius, as represented in Plate X., also in Plate XI., *Figs.* 2 and 3. At the insertion of the tendon into the tubercle of the radius, there is generally either one or two bursæ mucosæ, as depicted in Plate X., marked with the digits 2.

* Syn. Primus flectentium cubitum, præter carnosam partem interiores principii. Primus cubitum flectens, præter alterius initii carnosam partem. Biceps. Cubitum flectentium primus, præter carnosam portionem in humeri medium insertam. Biceps manus. Biceps internus. Biceps brachii. Biceps ou coraco-radial. Scapulo-radial. Scapulo-coraco-radial.

At the elbow-joint, the muscle gives origin to a strong tendinous expanse l, that descends with oblique fibres across the pronator radii teres muscle I, and the flexor muscles of the fore-arm, and is incorporated with the general fascia investing these muscles, as represented in Plate IX., and in Part III., Plate XI., *Fig.* 2.* As the short head descends along the inside of the head of the os brachii, it is connected with the tendon of the subscapularis, where a bursa mucosa frequently exists. In the distal half of the arm, the belly of the muscle is connected by cellular membrane to the brachieus internus.

The biceps muscle elevates the arm, bends the fore-arm, and supinates the hand: it also assists the pectoralis major muscle in bringing the arm to the thorax; and aids the deltoid in throwing the arm and fore-arm forcibly forwards, as in boxing. When the upper extremity is fixed, the biceps is used in bringing the trunk to the arm; and when standing on the hands, this muscle assists in preserving the balance.

The coraco-brachialis muscle,† letters K, Plates VIII. and IX., is situated on the theno-ulnar, or anterior and

* As matter is sometimes deposited beneath the tendinous expanse of the biceps muscle, we should attend to the course of the fibres so as to divide them, care being taken to avoid the cutaneous veins and nerves as much as possible. See Part III., Plate XI., *Fig.* 2. The ulnar margin of the belly of the biceps relates to the securing of the brachial artery, as detailed in Part III., page 88. The long tendon of the biceps has a relation to amputation at the shoulder-joint, as described in Part III., page 85. The muscle is concerned in dislocation of the shoulder-joint, by putting the fore-arm in a semi-bent position; also concerned in dislocation of the elbow-joint when the coronoid process occupies the greater sigmoid cavity, by the bone of the fore-arm being forced anconad or backwards of the bone of the arm, making the fore-arm assume the same semi-bent position.

† Syn. Carnosa pars interioris principii cubitum flectentium primi. Carnosa pars alterius initii primi cubitum flectentis. Primi cubitum flectentis insignis musculosa portio, quam inter humeri motores jamdiu recenseo. Coracoideus, sive coraco-brachicus. Portio carnosa quam Placentinus pro peculiari musculo habuit, perforatum apellans. Coraco-brachial. Coraco-huméral.

inner aspect of the arm, ulnad to the short head of the biceps muscle I, with which it has a common origin from the coracoid process 5 of the scapula, and with which it descends to the middle of the arm, to be inserted into the ulnar aspect of the os brachii. The origin of this muscle is also connected with the insertion of the lesser pectoral muscle, and is tendinous and fleshy; the insertion appears more fleshy and less tendinous: but on examining that part of the insertion attached to the bone, it is found equally tendinous. This muscle, in its descent, adheres by cellular membrane to the insertion of the subscapularis, the conjoint tendons of the latissimus dorsi and teres major, and the third head of the triceps. To display this muscle, the ulnar margin of the biceps requires to be traced upwards or proximad, till we arrive at the union of the biceps to the coraco-brachialis.* The action of the coraco-brachialis is to assist the biceps in elevating the arm, throwing it across the thorax, and supinating the hand; also in throwing the arm directly forwards, as in pugilism.

The brachieus internus,† letters M, in Plates IX., *Fig.* 1, X. and XI., *Figs.* 1 and 2, also in Part III., Plate XII., *Fig.* 1, situated in the distal half of the arm, on the palmar or thenal aspect, beneath or centrad to the biceps muscle L, derives its origin fleshy from the os brachii on each side of the insertion b of the deltoid muscle, and descends adhering to the bone, and the capsular ligament of the elbow-joint, to

* The coraco-brachialis relates to the securing of the brachial artery, as detailed in Part III., page 88; also to dislocation of the shoulder-joint when into the axilla, by elevating the arm from the side.

† Syn. Secundus, seu cubitum flectentium posterior. Secundus cubitum flectens. Cubitum flectentium secundus, brachieus vocatus. Le brachial. Brachial interne. Brachial interne et antérieur. Humero-cubital.

be inserted into the coronoid process 3 of the ulna by a strong tendinous and fleshy mass.* The origin on the ulnar aspect is connected with the coraco-brachialis, and on the same side as the muscle descends, it is united with the third head of the triceps, the ulnar intermuscular ligament, and the pronator radii teres. On the radial margin this muscle is connected with the triceps, and the supinator radii longus. This muscle bends the elbow-joint.

The triceps extensor cubiti muscle,† letters G, g, g, in Part III., Plates XI. and XII., *Figs.* 1, and in Plates VIII. and IX. of this Part, is situated on the anconal aspect of the arm, forming the whole muscular mass; the first or long head G derives its origin from the inferior costa of the scapula, close to the glenoid cavity, descends along the anconal aspect of the arm, and joins the second head arising from the os brachii from the head downwards or distad, till it meets the third head arising from the remaining anconal surface of the bone; the three heads form a strong muscular mass, that is inserted tendinous into the olecranon ulnæ, as seen in Plate XII., *Fig.* 2, marked g, the

* The brachieus internus relates to dislocation of the elbow-joint, either when the bones of the fore-arm are forced backwards or anconad of the bone of the arm, or vicê versâ; when the former, this muscle is lacerated, and what remains sound, assists the biceps in putting the arm in a semi-bent position; when the bones of the fore-arm are forced forwards or palmad on the bone of the arm, this muscle is also lacerated.

† Syn. Longus est, cubitum extendentium primus; brevis est, tertius cubitum extendentium; brachialis externus, carnosa pars, qua primus extendentium angetur, quem secundum constituere licet. Tertius cubiti; brevis cum brachiali externo quartus cubiti. Longus; brevis; brachieus externus. Os cubiti extendentium secundus; longus una cum brachiali externo, est os cubiti extendentium primus. Brachieus externus; longus una cum brevi, gemellus. Brachialis externus; biceps externus; triceps totus, triceps cubiti, extensor cubiti magnus, triplici principio natus. Cubiti extensores. Le grand anconé; l'anconé externe; l'anconé interne. Triceps brachii. Scapulo-huméro-olecranien. Tri-scapulo-huméro-olecranien.

bone being marked 6. The first head has a broad tendinous origin, that separates the teres major muscle F from the minor muscle 80, as seen in Part III., Plate XII., *Fig.* 1, but is connected with these by cellular membrane. The second and third heads are separated by the spiral nerve 6 and profunda superior artery f, as represented in Part III., Plate XI., *Fig.* 1, and can be only distinguished on the palmar or thenal aspect; for they are united on the anconal; and hence are very perplexing to the young dissector.*

The triceps extends or depresses the arm and fore-arm, assisting the latissimus dorsi and teres major muscles in the first of these functions.†

* The triceps muscle is concerned in amputation at the shoulder-joint, as described in Part III., page 85; also in dislocation of this joint, as detailed in page 64 of this Part.

† These muscles, as the triceps, biceps, brachieus internus, and coraco-brachialis, should be examined in their relation to amputation of the arm. In every amputation, the surgeon ought to consider what is to be the line of the stump, both as regards the arrangement of the muscles around the bone, and as relates to the exit of the matter while the patient is confined to bed in the horizontal posture. With regard to the former of these, the line of incision or cicatrix should extend from the radial to the ulnar aspect of the arm, so as to have the triceps on the one side, and the biceps with the coraco-brachialis or brachieus internus on the other side. With respect to the position of the limb in bed, the line of cicatrix should run in the reverse direction, or from palmar to anconal aspect. As the arm, however, may be placed in a direction to give exit to the matter, whatever the line of cicatrix may be, this should extend from the radial to the ulnar aspect. A tourniquet should invariably be applied, as the trusting to the compression of the assistant may deprive the patient of life, if the assistant happen to faint or stumble, and hence remove the compression. The roller or pad should be placed over and along the course of the brachial artery h, see Part III., Plate XI., *Fig.* 1, and over the roller, the screw of the tourniquet ought to be put. When the pulsation at the wrist is found arrested by the tourniquet, and an assistant has retracted the skin gently upwards or proximad, two semi-elliptical incisions are to be made with a large scalpel, their convexities pointing downwards or distad, and their extremes meeting radiad and ulnad, through the integuments and muscles, as deep as the

The anconeus muscle† E, in *Figs.* 1 and 2 of Plate XII., is situated on the anconal aspect of the fore-arm in its proximal fourth, and appears as a continuation or appendage of the triceps g. It derives its origin from the radial or external condyle of the os brachii, by an acute point, and descends with diverging fibres obliquely downwards, to be inserted into the ulna, on its radio-anconal aspect, nearly one-fourth of its length from the olecranon, occupying that triangular space between the olecranon and coronoid process on the anconal aspect of the bone, which is marked 7, in *Fig.* 6 of Plate VII. of Part I. The muscle is intimately connected with the capsular ligament of the elbow-joint, with the triceps g, extensor carpi ulnaris B, also with the supinator radii brevis 55.‡

The function of the anconeus is to extend the ulna

operator can accomplish. Generally two sweeps of the scalpel on each side, enables the surgeon to reach the bone, which should then be carefully cleared of the adhering muscular fibre. The flaps are then held aside by linen or leather retractors, and the bone sawn through with long gentle sweeps of the saw, no weight being given to the instrument. The posterior or anconal incision should be made first, to prevent the blood obscuring the lines of the incision. The artery or arteries are then to be secured, see Part III., Plate XI., *Fig.* 1, and afterwards the tourniquet removed. In ascertaining if all the arteries are secured, the tourniquet should be promptly, not slowly, unscrewed. The ligatures should be cut off entirely, the lips of the wound approximated by adhesive straps, dry lint applied over these, then the malta cross and a roller first bandaged from the trunk down to the face of the stump, and then up again near to the shoulder. The patient should remain in bed for at least a week, to ensure adhesion of the coats of the artery; but this must be regulated by a variety of circumstances, as fever, inflammation, or suppuration. The reason I mention at least a week, I have seen many die from secondary hemorrhage, in consequence of being allowed to get out of bed too soon: again, many sink from too long confinement to bed.

† Syn. Anconeus vel cubitalis. Angoneus. Anconæus. Anconeus brevis. Anconeus. Le petit anconé. Epicondylo-cubital.

‡ This muscle relates to dislocation of the elbow-joint.

anconad on the os brachii, and hence to assist the triceps in extending the elbow-joint.

When the preceding long muscles extending over the shoulder-joint have been investigated, the short ones around the joint with the ligaments should be examined. The teres major muscle, however, has been forgotten, which might have followed the latissimus dorsi, having the same point of insertion, and appearing at first as an appendage.

The teres major muscle,* letters F, Plate VIII. of this Part, and V. of Part IV., also Plates XI. and XII., *Figs.* 1, of Part III., is situated in the inferior or sacral fold of the axilla, being concealed by the latissimus dorsi E, with which it is incorporated; arises from the posterior or dorsal surface of the inferior or sacral angle of the scapula, and advances along with the latissimus dorsi muscle, keeping on its dorsal or posterior surface, to be inserted conjointly into the ulnar ridge of the bicipital groove.† The origin of this muscle is most distinctly seen in Part III., Plate XII., *Fig.* 1, where it is observed arising tendinous, and connected with the expanded tendon enveloping the infra-spinatus 81 and teres minor 80, muscles, covering in some measure the origin of the latter. The insertion is represented in Plate XI., *Fig.* 1, of the same Part, and in Plate VIII. of this Part. In *Figs.* 1 and 2 of Plate IX., the conjoint insertions of the latissimus dorsi and this muscle are more clearly represented, but are only marked with the letter E, which is the index of the latissimus dorsi, since the tendons are so in-

* Syn. Tertius brachium moventium. Tertius humeri musculus. Rotundus major. Deprimens humerum rotundus. Le grand rond. Scapulo-huméral. Anguli-scapulo-huméral.

† The teres major muscle may be said to have the same relations to surgery that the latissimus dorsi has; that of securing the axillary artery, that of amputation at the shoulder-joint, and to dislocation of this joint, as described in page 64.

corporated. On the sternal or thoracic aspect, this muscle is connected with the subscapularis muscle. The function of this muscle is nearly the same as that of the latissimus dorsi, being a depressor of the arm, and a pronator of the hand, by rolling ulnad the os brachii on the glenoid cavity of the scapula. When the bone of the arm is fixed and elevated, the teres major will assist in bringing the scapula to the arm.

The teres minor muscle 80,* delineated in Part III., Plate XII., *Fig.* 1, is properly an appendage of the infra-spinatus muscle 81, being enveloped conjointly in a tendinous expanse, and generally requiring some degree of violence to separate them. The teres minor, situated at the sacral or lower margin of the infra-spinatus, extends along the inferior costa of the scapula, and is separated by the long head G of the triceps muscle from the teres major. The teres minor arises from the inferior costa of the scapula, to which, as well as the exterior surface of the capsular ligament of the shoulder-joint, it adheres, and is inserted along with the infra-spinatus muscle 81, and the supra-spinatus muscle 66, into the radial and larger tubercle of the head of the os brachii.† The commencement of the origin of the teres minor is concealed by the teres major, as represented in Part III., Plate XII., *Fig.* 1; and the insertion of the muscle is so incorporated with that of the infra-spinatus muscle 81, that in Plate IX., *Fig.* 1, the latter only is delineated. The teres

* Syn. Octavus movens humerum. Rotundus minor. Musculus peculiaris a nemine adhuc annotatus, cujus inventionem placentinus, sibi tribuebat. Le petit rond. Plus petit sus-scapulo-trochitérien. Margini-sus-scapulo-trochitérien.

† The teres minor muscle relates to amputation at the shoulder-joint, as detailed in Part III., page 85; and to dislocation of this joint, as will be shortly described. In this accident this muscle is more or less lacerated, in consequence of the shortness of the muscular fibres.

minor rotates the head of the os brachii on the glenoid cavity of the scapula, and hence supinates the hand; also depresses the arm sacrad and dorsad, assisting the teres major and latissimus dorsi muscles.

The musculus infra-spinatus 81,* represented in *Fig.* 1, Plate XII. of Part III., in Plate V. of Part IV., and in *Fig.* 1, Plate IX. of this Part, occupies nearly all the infra-spinal fossa of the scapula, and is partly obscured by the deltoid B, the teres major F, and latissimus dorsi E muscles. The infra-spinatus derives its origin from that portion of the infra-spinal fossa which is not occupied by the teres major and minor muscles, and from the inferior margin of the spine itself; it proceeds adhering to the exterior surface of the capsular ligament of the shoulder-joint to be inserted along with the teres minor 80 and the supra-spinatus muscle 66 into the radial and larger tubercle of the head of the os brachii.† This muscle is connected with the teres minor by a strong tendinous aponeurosis, that gives attachment to the tendons of the deltoid and trapezius muscles. The insertion is inseparable from that of the teres minor, or of the supra-spinatus, and is with equal difficulty detached from the capsular ligament: the insertion is depicted in Plate IX., *Fig.* 1. The infra-spinatus pulls the head of the os brachii dorsad, and rotates it on the glenoid cavity, and hence supinates the hand. The superior fibres contribute to elevate, and the lower fibres to depress the arm.

* Septimus brachium moventium. Sextus humeri musculus. Circumagentium secundus, super-scapularis inferior. Le sous-epineux. Grand sus-scapulo-trochitérien. Sous-spini-scapulo-trochitérien.

† This muscle relates to amputation at the shoulder-joint, as described in Part III., page 85; and to dislocation of this joint as described in page 64. In such an accident, this muscle is more or less torn.

The supra-spinatus muscle 66,* depicted in *Fig.* 1, Plate XII. of Part III., in Plate V. of Part IV., and *Fig.* 1, Plate IX. of this Part, occupies the supra-spinal fossa of the scapula, being concealed by the insertion of the trapezius muscle 80, the omo-hyoideus muscle U, the acromion scapulæ D, and the scapular end of the clavicle. This muscle deriving its origin from the supra-spinal fossa, runs beneath the jugum formed by the junction of the clavicle and acromion scapulæ, adheres to the exterior surface of the capsular ligament in its course, and is inserted into the radial and larger tubercle of the head of the os brachii, together with the infra-spinatus and teres minor muscles. In Plate V. of Part IV. this muscle is observed to be covered by a strong tendinous expanse, similar to that which covers the infra-spinatus. In Plate IX. of this Part, the muscle is represented as it advances beneath the clavicle A, and acromion scapulæ D, and the origin B of the deltoid muscle, to be inserted into the radial tubercle: its tendon adheres strongly to the capsular ligament, and forms part of the bursa *a* of the deltoid.†

This muscle assists the deltoid in elevating directly atlantad the arm.

The subscapularis muscle,‡ letters I, in Plate VIII., and in *Figs.* 1 and 2 of Plate IX., occupying all the venter of the scapula, adheres by cellular membrane, and some-

* Quintus brachium moventium. Quintus humeri musculus. Circumagentium humerum primus, super-scapularis superior. Le sus-epineux. Petit sus-scapulo-trochitérien. Sus-spini-scapulo-trochitérien.

† This muscle is concerned in amputation at the shoulder-joint, described in Part III., page 65; also in dislocation of the shoulder-joint, as detailed in page 64 of this Part.

‡ Sextus brachium moventium. Septimus humeri musculus. Immersus sive subscapularis. Circumagentium tertius, subscapularis. Le sous-scapulaire. Sous-scapulo-trochinien.

times by tendinous bands, to the serratus major anticus muscle, letters o. It arises from the venter of the scapula, and proceeds adhering to the capsular ligament of the shoulder-joint, and running beneath the coraco-brachialis, and short head of the biceps muscle, to be inserted into the ulnar and smaller tubercle of the head of the os brachii. Where this muscle derives its origin from the venter near the base of the scapula, the serratus muscle o is inserted; and where the muscle arises near the inferior costa, it is connected with the teres major and minor muscles. In *Fig.* 2 of Plate IX., the surface of origin of this muscle is marked with the letters *i*; and the tendon, where it adhered to the capsular ligament *t*, is marked i. A bursa mucosa sometimes exists between the superior or proximal portion of the insertion of this muscle and the capsular ligament, communicating, however, generally with the interior of the joint. In *Fig.* 1 of the same Plate, the insertion i is represented in connexion with the tendon of the supra-spinatus 66, by strong ligamentous matter, so extending across the bicipital groove as to form a sheath to the long tendon *l* of the biceps.*

The function of the subscapularis muscle is to rotate the head of the os brachii inwards or ulnad on the glenoid cavity of the scapula, and hence to assist in pronating the hand. The superior fibres of the muscle assist the supra-spinatus muscle in elevating the arm, while the inferior fibres depress the arm.

* The subscapularis is concerned in amputation at the shoulder-joint, as described in Part III., page 85; and in dislocation of this joint, as detailed in page 64 of this Part. The short distance between its origin and insertion is clearly represented in *Fig.* 2, and shows how easily and readily this muscle must be lacerated in luxation of the shoulder-joint. The same observation is applicable to the supra-spinatus, the infra-spinatus, and the teres minor muscles.

is attached to the coracoid process by a greater extent of surface than to the acromion scapulæ; its anterior or dis-

As a natural consequence of this feeble protection, when the arm is violently raised, twisted, or receives a blow upon the shoulder, the head of the os brachii ruptures the capsular ligament, and protrudes in this direction. When the head of the bone of the arm is thus dislocated into the axilla, the capsular ligament is, and must be, always lacerated, as well as one or more of the short muscles torn. The muscles that are put on the stretch are the deltoid, the supra-spinatus, the infra-spinatus, the teres minor, and the biceps; the position of the arm, therefore, is semi-bent, and raised a little outwards from the side. There is a conspicuous depression beneath or distad to the acromion scapulæ, in place of the round swell of the shoulder; and the patient inclines the trunk to the arm to relax the muscles, and supports the arm on his knee, or with the other hand. Besides the direction into the axilla, the head of the os brachii is sometimes forced beneath the subscapularis muscle, between it and the venter of the scapula, and sometimes on the body of this muscle; at other times beneath the infra-spinatus and teres minor muscles, between them and the infra-spinal fossa or dorsum of the scapula, and occasionally on the surface of these muscles. When dislocation occurs upwards, there is fracture of the acromion, while the proper anterior ligament of the scapula remains sound. After the first dislocation into the axilla, reduction not being attempted or effected, the head of the bone of the arm is gradually dragged up on the thorax by the pectoralis major muscle and the biceps, and the latissimus dorsi muscle assists by pulling on the shaft of the bone, and hence forces upwards the head: this direction, however, in place of being consecutive, as thus described, is generally primary, as stated by Sir Astley Cooper, in his work on Fractures and Dislocations.

In one and all of these species of dislocations, when recent, bleeding should be employed to syncope, and then the action of the muscles may be overcome by a child; since reduction is rendered extremely easy and simple. When the luxation has been of some days standing, bleeding is less necessary, and the pulley apparatus becomes indispensable. The objects the surgeon should have in view, are, to fix properly the scapula, to extend slowly and gradually in the direction in which the bone of the arm lies, and when the head of the bone appears opposite its glenoid cavity to relax suddenly the apparatus, and bend the arm downwards by the side. For example: When the head of the bone of the arm is dislocated into the axilla, and when the scapula has been properly fixed, the arm should evidently be raised a little above the horizontal plane before extension is begun, as the head of the bone must have been in this direction when dislocated, or would assume this direction, did not the weight of the whole arm prevent it. After recent dislocation, a wet hand towel should be put round the arm, immediately above the elbow-joint, and

tal margin is generally lost in a thin tendinous expanse, which being connected with the deltoid and the short head of the biceps, assists to form the large bursa mucosa *a* of the deltoid muscle.

The ligamentum trapezoideum, and ligamentum conoideum, marked 8, in *Figs.* 1 and 2 of Plate IX., are, strictly speaking, one and the same ligament, having merely two surfaces, which, in consequence of their resembling these geometrical figures, have thus been denominated. The surface looking sternad or forwards, is named trapezoid,* while that which points backwards or dorsad, is termed conoid.† The ligament is connected to the coracoid process 5 of the scapula by an acute attachment, while it spreads out in its connexion with the clavicle A, so as to extend near to its scapulary extremity, occupying a rough surface on the inferior or sacral aspect of the bone.‡ Sometimes these ligaments are quite distinct, being separated by the tendinous termination of the insertion of the subclavius muscle.

to this should be affixed the two ends of a dry towel, the noose of which is to be afterwards thrown round the shoulders of the operator. The patient standing erect, is to be bled in the opposite arm to syncope, and the moment he is prostrated, the surgeon throws the noose of the towel over his head, puts his heel into the axilla of the patient, and then gradually extends, directing the head of the bone of the arm opposite the glenoid cavity. So easily is the reduction effected, that he can scarcely believe the joint was luxated. Besides bleeding, in old dislocations, the warm-bath and the tartrate of antimony administered to produce sickness, are beneficial; but the apparatus should be ready to be applied during this state of the system, otherwise the muscles soon regain their rigidity and resistance. The mind has considerable influence in opposing an obstacle to reduction, for if diverted, the bone is easily reduced.—For further information on dislocation of the shoulder-joint, consult Dessault, Pott, and Sir Astley Cooper.

* Syn. External coraco-clavicular ligament.

† Syn. Internal coraco-clavicular ligament.

‡ This powerful ligament prevents the frequent dislocation of the scapulary extremity of the clavicle.

The capsular ligament connecting the scapulary extremity of the clavicle to the scapula, is represented in *Fig.* 1 of Plate IX., marked 9, where there are also observed strong short exterior ligamentous fibres extending between these bones. These ligamentous fibres appear to be chiefly the tendinous insertion of the trapezius muscle. The articulation here being extremely small and shallow, the articular surfaces in the dried bones are barely perceptible.*

The ligamentum proprium scapulæ posticum, is marked *a* in *Fig.* 2 of Plate IX., and is also represented in *Fig.* 1, Plate XII., of Part III. It extends between the root of the coracoid process 5, and the contiguous commencement of the superior costa *b* of the scapula, making the notch a foramen, that gives passage to the supra-scapular nerve, artery, and vein; the two latter of which here drawn truncated, are delineated in Part III., Plate XII., *Fig.* 1, and the notch *o* with a dotted line representing the ligament, is depicted in Part I., Plate VII., *Figs.* 1 and 2.

The muscles of the fore-arm should next be examined; they arrange themselves into pronators and supinators; and into flexors and extensors; the supinators and exten-

* Luxation of the scapulary extremity of the clavicle more frequently occurs than that of its sternal end. In this the clavicle starts above the acromion scapulæ on which it rests, so that there does not appear to the surgeon much derangement of structure; the capsular ligament of the joint, and the greater portion of the coraco-clavicular ligament only is torn: sometimes, however, all this ligament is lacerated. If the spine of the scapula is traced from the base onwards to the acromion, the elevated end of the clavicle will interrupt the fingers. A cushion put into each axilla, and the shoulders braced backwards by the clavicle bandage, will reduce the clavicle, and keep it in situation. The straps of the bandage, particularly that over the luxated joint, should be sufficiently broad to cover the bone; and it sometimes requires a pad affixed to it. The fore-arm should be placed across the chest, and supported by a bandage.

sors are more or less connected with the external condyle of the os brachii, and one of the pronators with the majority of the flexors are more or less attached to the internal condyle of the same bone: the extensors are subdivided into those which extend the carpus, and those which extend the fingers in general; the flexors are subdivided into those which inflect the carpus, and those which bend the fingers, the latter of which have muscles acting as auxiliaries. Besides these classes of muscles, some are peculiar to the thumb, others peculiar to the fore-finger, and others again to the little finger.

The two pronators are represented in Plates X. and XI.; the teres in Plate X. is marked I, the quadratus in Plate XI., *Figs.* 1 and 2, is marked 50. These are also drawn in Part III., Plates XI. and XII., *Figs.* 2.

The musculus pronator radii teres I,* situated in the upper or proximal half of the thenal or palmar aspect of the fore-arm, deriving its origin from the internal or ulnar condyle of the os brachii, descends obliquely downwards or distad to the radial or outer margin of the fore-arm, and is inserted into the radial and somewhat anconal aspect of the middle of the radius. The origin of this muscle, distinctly seen in Plate IX., *Fig.* 1, where it is observed to arise chiefly fleshy and highest or most proximad of the muscles connected with the internal condyle, is, properly speaking, attached to the ridge proximad of this condyle. The brachieus internus muscle M is on its proximal aspect, the supinator radii longus N on its radial, and the flexor carpi radialis muscle P on its distal and ulnar margin. A delicate ligament, named the inter-

* Syn. Tertius radium peculiariter agentium. Septimus manus interior musculus. Superior pronator rotundus. Pronator secundus, sive teres. Pronator teres. Le pronateur rond, ou l'oblique. Grand pronateur. Epitrochlo-radial.

nal or ulnar intermuscular ligament, marked in *Fig.* 2, Plate XI. with the digits 28, separates the precise origin of this muscle from the triceps *g*. The insertion is bounded proximad by the supinator radii brevis 55, and distad by the flexor digitorum sublimis R; running beneath the supinator longus N, and the two radial extensors H, *h*. In its course deriving origin from the brachieus internus, the flexor carpi radialis, and the flexor digitorum sublimis, it is frequently pierced by the median nerve. This muscle, and all those of the forearm, are intimately connected by the fascia of the forearm, as exemplified in *Fig.* 2, Plate XI., of Part III.; and this muscle, together with the flexors, is still more incorporated by the fascia l of the biceps, represented in the Plate just alluded to, and more distinctly seen in *Fig.* 1, Plate IX., of this Part V. The manner of separating these muscles, therefore, is to find out first their tendinous insertions, and retrace them to their origins. The insertion of the pronator radii teres partly tendinous and partly fleshy, runs around the radius; and a scabrous surface is observed on the bone, as delineated in Part I., Plate VII., *Figs.* 5 and 6, letter *g*.*

This muscle pronates the hand, as its name indicates, and also inflects thenad the fore-arm on the arm. I shall next describe the pronator quadratus, in order to impress on the mind the classification of these muscles of the forearm, although it does not come in the order of dissection. The drawings are taken in this order, so that the student

* The pronator radii teres relates to the securing of the radial artery, as detailed in page 92 of Part III.; to luxation of the elbow-joint; and to fracture of either the radius or ulna, or both. When one or both of these bones are fractured, the pronators, being more powerful than the supinators, pronate the hand, an attitude which must be counteracted by splints and bandage.

can easily investigate them when engaged in prosecuting practical anatomy.

The pronator quadratus muscle,* marked with the digits 50, in Plate X., and in *Figs.* 1 and 2 of Plate XI., also in Part III., Plate XII., *Fig.* 2, is situated at the distal extremity of the bones of the fore-arm, on the thenal aspect, deeply beneath the various flexors. This muscle is represented alone in *Fig.* 2 of Plate XI. of this Part, arising tendinous and fleshy from the ulnar angle of the ulna, and proceeding with fleshy fibres transversely across, adhering to the interosseous ligament, to be inserted with fleshy and tendinous fibres into the radial and also the anconal aspect of the radius. The insertion runs beneath the supinator radii longus N; and the distal margin of the fibres adheres to the sacciform ligament. The action of the muscle is to assist the teres in pronating the hand.†

The antagonist muscles of these two preceding pronators, are two supinators, a long and a short.

The musculus supinator radii longus‡ N, in *Fig.* 1 of Plate IX., in Plate X., and in *Fig.* 1 of Plates XI. and XII., also in Part III., Plates XI. and XII., *Figs.* 2, situated on the radial margin of the fore-arm, derives its origin from the radial ridge of the os brachii proximad to the radial or outer condyle, and descends spirally along

* Syn. Primus radium peculiariter agentium. Octavus manus interior musculus. Inferior pronator quadratus. Pronatorum primus, sive quadratus. Pronator radii quadratus. Pronator radii quadratus, or inferior quadratus. Le pronateur quarré, ou transverse. Petit pronateur. Cubito-radial.

† The pronator quadratus can have little concern in either dislocation or fracture; in the latter, it tends to pronate the hand, an attitude to be avoided in either fracture of the radius or ulna, or both.

‡ Syn. Quatuor radium peculiariter agentium secundus. Octavus manus exterior musculus longissimus nuncupatus. Longus supinator. Supinatorum primus sive longior. Supinator longus. Grand supinateur. Brachio-radialis. Humero-sus-radial.

the fore-arm to the thenal or palmar aspect, to be inserted into the distal extremity of the radius, somewhat on its palmar aspect, being partially overlapped by the extensor ossis metacarpi pollicis *a*.* The origin of this muscle is very high up or proximal on the os brachii, and is the most superficial or proximal of the muscles connected with the external or radial condyle; it is fleshy, and is separated from the triceps g by the external or radial intermuscular ligament 25, as seen in *Figs.* 1 and 2 of Plate XII. In its proximal and thenal margin, this muscle is intimately connected with the brachieus internus, the spiral nerve 6 forming the only division; as the muscle descends, the thenal and ulnar margin is attached first to the pronator teres I, and secondly, to the flexor carpi radialis P. The anconal margin of the muscle is attached to, and in some measure overlaps the extensor carpi radialis longior H. The muscle becomes tendinous about the distal third of the fore-arm, and is inserted into a ridge of the radius, as delineated in Part I., Plate VII., *Fig.* 5, letter *l*.

This muscle, as its name indicates, supinates the hand, though that able anatomist Dr. Barclay is of opinion, that it merely co-operates with, and moderates alternately the pronators and supinators, bringing the radius to that middle state which is properly neither pronation nor supination, and performing this office with the greatest force when the arm is extended.

The supinator radii brevis muscle,† marked with the digits 55 in Plate X., and in *Fig.* 1 of Plate XI., also in

* The supinator longus muscle relates to the securing of the radial artery, as described in Part III., page 92; and to dislocation of the elbow-joint, as well as to fracture of the bones of the fore-arm.

† Syn. Quartus radium peculiariter agentium. Nonus manus exterior musculus. Brevis supinator. Supinatorum secundus. Supinator brevis. Le court ou petit supinateur. Epicondylo-radial.

Fig. 2 of Plate XII., is situated on the radial aspect of the proximal third of the fore-arm, beneath all the extensors, adhering close to the bones; derives its origin from the external or radial condyle of the os brachii, descends adhering to the capsular ligament, and embracing the radius from the head downwards about the proximal third, where it is inserted immediately above or proximad to the insertion of the pronator radii teres I. This muscle is completely concealed by the long supinator N and the radial extensors H, *h*, of the carpus. The origin and for some extent on the anconal aspect, the muscle is so connected with the extensor digitorum communis D, that it may be said to arise from the latter; the origin from the condyle is also very closely attached to the extensor carpi radialis brevior *h*: this muscle arises likewise from the ulna where the anconeus E is inserted. The insertion is bounded on the anconal aspect by the extensor ossis metacarpi pollicis *a*. Sometimes a portion of the origin of this muscle is so strong and tendinous as to be mistaken for the external or radial lateral ligament 25, of which it in reality forms a part. The deep branch 26 of the spiral nerve 6, pierces the substance of the muscle, as represented in Plate X., and in Plate XII., *Fig.* 2, of Part III.* This muscle assists in supinating the hand, and prevents the capsular ligament being injured in the motions of the elbow-joint; it must also contribute greatly to the support of the joint.

After the pronators and supinators have been investigated in this order of classification, the flexors and extensors of the carpus should be examined. The flexors are two in number, a radial and an ulnar, while their antago-

* The supinator radii brevis relates to dislocation of the elbow-joint.

nists the extensors are three in number, an ulnar and two radial; the latter, however, might be considered one muscle with two tendinous insertions.

The flexor carpi radialis * P, in Plate X., in *Fig.* 1 of Plate IX., and in *Figs.* 1 and 2 of Plate XI., of this Part, and in Plate XI., *Fig.* 2, of Part III, situated on the thenal or palmar aspect of the fore-arm, between the pronator radii teres I, and the palmaris longus Q, derives its origin from the internal or ulnar condyle of the os brachii, descends obliquely along the fore-arm near the radial margin, to the palmar annular ligament U of the carpus, beneath which it runs in a groove of the os trapezium, as represented in Plate XI., *Figs.* 1 and 2, to be inserted into the base or root or proximal extremity of the metacarpal bone 2 of the fore-finger.† At its origin, this muscle is connected to the pronator teres and the other flexors, and even for the whole length of its carneous fibres is connected with the pronator teres and the palmaris longus, also with the flexor digitorum sublimis, from which it appears as if deriving fleshy fibres. The tendon begins about the middle half of the fore-arm, and is bold and strong; in the groove of the trapezium, it is encased in a vaginal ligament, remarkably strong, and to which it adheres; and beyond the groove of the trapezium, it runs beneath the flexor longus pollicis X, the inner or central head *z* of the flexor brevis pollicis, and the adductor pollicis W, all of which is distinctly seen in *Figs.* 1 and 2 of Plate XI.

* Syn. Secundus brachiale moventium. Tertius interior manus musculus. Radieus internus. Flectentium carpum exterior. Radialis internus. Le radial interne. Le radial antérieur. Grand palmaire. Epitrochlo-métacarpien.

† The flexor carpi radialis relates to the securing of the radial artery, as described in page 92 of Part III. When this artery becomes the seat of operation in the proximal third of the arm, the most easy way to ascertain its course, is to retrace

This muscle inflects thenad the carpus on the fore-arm, and the fore-arm on the arm; also assists in pronating the hand; likewise inflects the carpus radiad.

The flexor carpi ulnaris * s, Plate X., and *Fig.* 1, Plate XI., also in *Figs.* 2, Plates XI. and XII. of Part III., situated on the thenal or palmar aspect of the fore-arm, close to the ulnar margin, arises from the internal or ulnar condyle of the os brachii, and from that space of the ulna between its olecranon and coronoid processes; also from the ulnar angle of the same bone downwards or distad upwards of two-thirds of the bone, descending on the ulnar margin of the fore-arm, to be inserted into the os pisiforme T of the carpus.† The origin from the os brachii is chiefly tendinous, that from the ulna is partly tendinous and partly fleshy; as the muscle descends it appears to grow from the ulna: between the muscle and the projection of the ulnar condyle, the ulnar nerve twines round, as represented in Part III., Plate XI., *Fig.* 1, and Plate XII., *Fig.* 2. The palmaris longus muscle Q intervenes

the tendon of this muscle upwards or proximad, making a calculation as we advance for the intervention of the pronator teres muscle; the two latter with the supinator radii longus form the boundaries of the radial artery, and these muscles are so connected by the fascia of the arm, as to conceal completely the vessel, in the two upper or proximal thirds of its course. This muscle also relates to dislocation of the elbow and wrist-joints, and to extirpation of the metacarpal bone of the fore-finger.

* Syn. Primus brachiale moventium. Secundus musculus interior manus. Cubiteus internus. Flectentium (carpum) interior. Flexor carpi ulnaris. Ulnaris internus. Cubital interne. Cubito-carpien. Epitrochlo-cubito-carpien.

† The flexor carpi ulnaris relates to the securing of the ulnar artery, as described in Part III., page 90. When this artery requires to be taken up, the operator should retrace the flexor ulnaris from its insertion into the pisiform bone, upwards to where the artery is to have a ligature thrown around. This muscle relates also to dislocation of the elbow and wrist-joints, and to fracture of the radius and ulna.

between this and the flexor radialis. As the muscle extends along the ulna, it is connected with the extensor carpi ulnaris B, as seen in *Figs.* 1 and 2 of Plate XII., on its anconal aspect, and with the palmaris longus Q, the flexor digitorum sublimis R, and profundus W, on its central and radial aspects. Its insertion is more or less connected with the palmar annular ligament U.

The extensor carpi ulnaris* B, in *Figs.* 1 and 2 of Plate XII., and in Part III., Plate XIII., situated on the ulnar margin of the anconal aspect of the fore-arm, derives its origin from the external or radial condyle *q* of the os brachii, in conjunction with the extensor communis D and the anconeus E, from the capsular ligament of the elbow-joint, and from the ulnar margin 12 of the ulna nearly the two proximal thirds, then becoming tendinous, and running beneath the annular ligament U, in a groove of the ulna between the distal head and the styloid process onwards to be inserted into the proximal extremity or root of the metacarpal bone 5 of the little finger. The radial margin of the muscle is connected with the supinator radii brevis 55, the three extensors of the thumb, *a*, *b*, *c*, and the indicator *f*.†

The function of this muscle is to extend the carpus or wrist-joint anconad, also to inflect it ulnad, and to extend the ulna on the os brachii or the elbow-joint.

The extensor carpi radialis is divided into two muscles, a longior H, and a brevior *h*, as seen in Plate XII.,

* Syn. Tertius brachiale moventium. Sextus manus exterior musculus. Cubiteus externus. Extendentium (carpum) interior. Extensor carpi ulnaris. Ulnaris externus. Le cubital externe. Le cubital postérieur. Cubito-sus-métacarpien. Epicondy-cubito-sus-métacarpien.

† The extensor ulnaris relates to dislocation of the elbow and wrist-joints, and also to extirpation of the metacarpal bone of the little-finger.

Figs. 1 and 2. The extensor carpi radialis longior H, * situated immediately beneath the supinator radii longus N, on the radial margin of the fore-arm, derives its origin from the radial ridge of the os brachii, proximad to the radial or outer condyle, descends in company with the brevior *h* along the radial margin of the radius, becoming tendinous near the proximal third of the fore-arm, and continues its course beneath the three extensors *a*, *b*, *c*, of the thumb and the annular ligament U, to be inserted into the root or proximal extremity of the metacarpal bone 2 of the fore-finger. The origin purely fleshy, is intimately connected with the long supinator N, the extensor carpi radialis brevis *h*, and the brachieus internus M; the external or radial intermuscular ligament 25, separates the precise origin from the triceps g, as delineated in *Fig.* 2. In the same figure, the insertion is more distinctly seen. †

The function of this muscle is to extend the carpus on the distal extremity of the radius, or to inflect anconad the wrist-joint, and to extend the ulna on the os brachii, or to inflect anconad the elbow-joint. It also inflects the carpus radiad.

The extensor carpi radialis brevior,‡ *h*, Plate XII., *Figs.* 1 and 2, is situated immediately beneath the exten-

* Syn. Pars quarti brachiale moventium. Pars septimi manus exterioris musculi. Radieus externus qui ab acumine osseo seu a condylo externo brachii enascitur. Pars extendentium carpum exterioris. Radialis externus longior. Extensor carpi radialis longus aut superior. Radialis externus longus. Le premier radial externe. Grand radial. Huméro-sus-métacarpien.

† The extensor carpi radialis longior relates to dislocation of the elbow and wrist-joints, and to fracture of the radius and ulna.

‡ Syn. Pars quarti brachiale moventium. Pars septimi manus exterioris musculi. Brevior radieus externus, qui à condylo externo brachii oritur. Radialis externus brevior. Extensor carpi radialis brevis seu inferior. Radialis externus brevis. Le second radial externe. Petit radial. Epicondylo-sus-métacarpien.

sor carpi radialis longior H, on the radial margin of the radius; derives its origin from the radial or external condyle of the os brachii, and descends along the supinator radii brevis 55, and the radius itself, forming a long tendon that runs beneath the three extensors of the thumb, *a*, *b*, *c*, and the annular ligament U, to be inserted into the proximal extremity or root of the metacarpal bone 3 of the middle finger. The origin is a strong roundish tendon, that is closely attached to the longior H, and to the extensor digitorum communis D, and also adheres to the capsular ligament of the elbow-joint. The insertion is in some degree covered by the tendon of the extensor communis, that goes to the fore-finger.*

The function of this muscle is precisely the same as that of the extensor longior.

The palmaris longus muscle Q,† in Plate X. of Part V., and in *Fig.* 2, Plate XI., of Part III., situated in the centre of the palmar or thenal aspect of the fore-arm, between the flexor carpi radialis P, and flexor carpi ulnaris S muscles, derives its origin from the ulnar or internal condyle of the os brachii, descends somewhat spirally along the fore-arm, and forms an elegant long tendon, which at the annular ligament U of the carpus, spreads with radiating fibres, marked V, extending over the whole palm of the hand, and inserted into the cutis vera. The origin is acute, strong, and chiefly tendinous, and intimately connected with the flexor carpi radialis P, and

* The extensor carpi radialis brevior has the same relation to surgery that the longior has.

† Syn. Musculus, nervosa sua exilitate mediæ volæ et internæ digitorum sedis cuti subnatus. Primus musculus manus interior. Latescentis chordæ musculus. Palmaris. Le cubital grêle, communément nommé long palmaire. Le palmaire grêle, ou long palmaire. Grand palmaire. Epitrochlo-palmaire. Epitrochlo-carpi-palmaire.

the flexor digitorum sublimis B, the former of which it approaches nearer and nearer in its descent along the fore-arm, while it rests on the latter. It becomes tendinous near the upper or proximal half of the fore-arm.* At the carpus it is strongly connected with the annular ligament C, from which it appears to derive additional tendinous fibres. The expanse of the tendinous aponeurosis becomes delicate over the muscles of the thumb and of the little finger.

The tendinous threads connected with the cutis vera are inserted chiefly at the roots of the fingers;† some, however, descend between the fingers, run along and around to their anconal aspect; while others run also along the thumb. Some descend on each side of the flexor tendons, and are inserted into the heads of the metacarpal bones. At the roots of the fingers in the palm of the hand there are a number of strong transverse threads interlacing and connecting the longitudinal ones.

* The palmaris longus relates to the securing of the ulnar and radial arteries in the carpus, as described in pages 90 and 92 of Part III., to injuries of the hand, to abscesses, to dislocation of the wrist-joint and the elbow-joint. When matter is deposited beneath the fascia palmaris, free exit should be given by transverse incisions, even at the risk of the arteries; for when these are wounded, a piece of dry sponge will stem the hemorrhage. Frequently after inflammation of the fascia palmaris, with or without abscess, a contraction of it takes place, so as to bend palmad one or all of the fingers, and retain them in this attitude, thus rendering them of little or no use to the individual. I have examined a number of such cases which have come into the dissecting-room, and all of these have had the flexor tendons sound and free in their sheaths, proving incontestably that they are never the seat of the contraction. I have kept one as a preparation. When, therefore, such a contraction occurs, a free transverse division of the integuments, and the fascia palmaris threads, now greatly thickened by disease, should be made across that, or those joints which are the seat of the disease. The fingers then ought to be kept extended till the wounds are healed. In confirmation of this opinion, see Sir Astley Cooper's valuable work on Fractures and Dislocations, page 524.

† Syn. Ligamenta cutanea digitorum.

The function of this muscle is to corrugate the integuments of the hand during its various motions, to inflect thenad or palmad the first or proximal joints of the fingers, the wrist-joint, and the elbow-joint. It also moves the metacarpal bones on the carpal, and the carpal on each other, and assists in pronating the hand.

The palmaris longus muscle is occasionally deficient.

Palmaris brevis muscle* 54 of Plate X., situated on the ulnar aspect of the palm of the hand, close to the os pisiforme T, consists of a few scattered delicate muscular fibres, that arise from the ulnar margin of the tendinous aponeurosis V of the palmaris longus Q, and run imbedded in the adipose substance, to be inserted by elegant tendinous threads, into the cutis vera covering the ulnar margin of the hand, immediately superficial to the origin of the abductor minimi digiti manus 51.† The use of this muscle is to corrugate the skin of the hand in this region.

The flexor digitorum sublimis perforatus‡ R, r, in Plate X. of Part V., and in *Figs.* 2, Plates XI. and XII., of Part III., situated on the palmar aspect of the fore-arm, hand, and fingers, and partially obscured by the flexor carpi radialis P, and the palmaris longus Q; derives its origin from the ulnar or internal condyle of the os brachii, from the coronoid process of the ulna, the capsular ligament of the elbow-joint, and the ulnar aspect of the upper or proxi-

* Est un altro musculo, che distende questa tela. Primus extremæ manus musculus scriptoribus ignotus. Caro quædam, quæ musculorum effigiem habet. Carpiens vel palmaris brevis. Caro quædam quadrata. Le palmaire cutané.

† This muscle has little or no relation to surgery.

‡ Syn. Primus digitos moventium. Quartus manus interior musculus. Primus musculus. Sublimis. Digitorum secundi internodii flexor. Perforatus. Le sublime perforé, communément le sublime. Fléchisseur digital superficiel. Epitrochlo-phalanginien commun. Epitrochlo-coroni-phalanginien.

mal half of the radius; the fleshy mass descending along the fore-arm, rests on the flexor digitorum profundus W, becomes tendinous near the annular ligament u of the carpus, beneath which it runs, dividing into four distinct round tendons, marked with the letters r, that advance along the palm of the hand and the fingers, to be inserted into the proximal extremities, or roots of the second or middle phalanges, adhering nearly to the distal extremities of these little bones. The origin of this muscle is intimately connected with the flexor carpi radialis P, the palmaris longus Q, the flexor carpi ulnaris S, the flexor digitorum profundus W, the brachieus internus M, and the pronator radii teres I. The ulnar nerve 5, and ulnar artery *h*, the latter of which pierces the muscle, separate it from the flexor profundus W on its ulnar margin, while the median nerve 2, which also pierces the muscle, separates it from the profundus W, and the flexor longus pollicis X on the radial margin. Near the first or proximal joints of the fingers, the tendons r, together with those w, of the flexor profundus W, are encased in strong tendinous sheaths 30: and between the first and second joints, the tendons are split into two *r*, by the passage of the tendons w of the profundus W. The divided tendons *r* diverge a little, so as to run near the edge of the bone. These tendons are generally bound down to the bones in their course by tendinous slips.* Where the tendons run in a mass beneath the annular ligament u, there is a bursa mucosa between this muscle and the flexor profundus.†

* Syn. Accessory ligaments of the flexor tendons. Tendinous frænа.

† This muscle relates to dislocation of the elbow-joint, the wrist-joint, and the proximal and medial joints of the fingers. It is also concerned in fractures of the radius, ulna, metacarpal bones, and bones of the first and second phalanges of the fingers, and in amputation of those members. It is likewise more or less con-

The vaginal ligaments* 30, of these tendons, extend from the first to the last joint of each finger, and are strongest at the joints. They are attached to the longitudinal ridges at the side of each phalanx, see Part I., Plate VII., *Fig.* 8, dig. 21, and have a mucous or synovial surface looking to the tendons, or pointing centrad.†

At the roots of the fingers, the posterior or anconal surfaces of these sheaths are firmly tied to each other by strong transverse ligaments, as represented in *Fig.* 1 of Plate XI., marked 34.

The function of this muscle is to bend the elbow-joint, the wrist-joint, and the first and second joints of the fingers; and also to assist in pronating the hand, and in inflecting ulnad the carpus.

The flexor digitorum profundus perforans‡ W, in Plate X. and *Fig.* 1 of Plate XI. of Part V., also in *Fig.* 2, Plate XII. of Part III., situated on the palmar aspect of the forearm, hand, and fingers, and obscured by the flexor carpi radialis P, the palmaris longus Q, the flexor digitorum sublimis R, and the flexor carpi ulnaris S, derives its origin from the

cerned in the extirpation of either of the bones of the fingers. Sometimes one of the tendons, together with that of the profundus and their vaginal ligament, so contract as to dislocate the proximal and medial phalanges, and prove so troublesome and inconvenient as to require amputation. See Sir Astley Cooper on Fractures and Dislocations, page 523.

* Syn. Crucial ligaments of the phalanges. Annular ligaments. Annuli juncturarum ligamentosi. Annuli vel ligamenta obliqua sive cruciata phalangis primæ et secundæ.

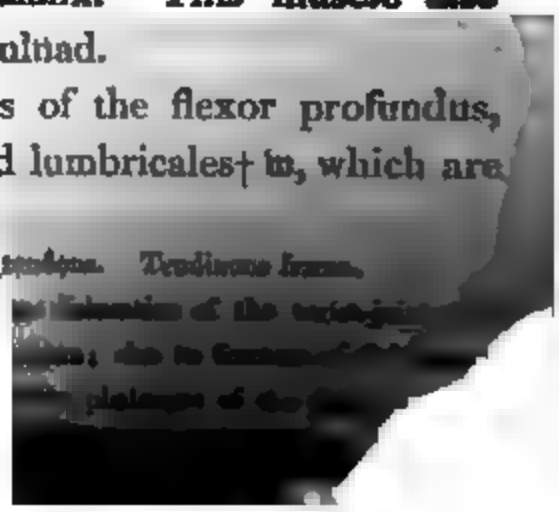
† These vaginal ligaments are often involved in the inflammation and suppuration of paronychia or whitloe, and require free incisions to give exit to the matter collected within them.

‡ Syn. Secundus digitos moventium. Quintus manus musculus interior. Secundus. Profundus. Flexor tertii digitorum internodii. Perforans. Le profond. Le perforant communément le profond. Fléchisseur digital profond. Cubito-phalangettien commun.

ulna, between the olecranon and coronoid processes, and from the ulnar angle of the same bone three-fourths of its length, also from the interosseous ligament. This bold muscular mass descends along the fore-arm, becomes tendinous about the middle, and near the annular ligament U, beneath which it runs, divides into four tendons W, that advance along the palm of the hand, to the middle of the first phalanx, where they pierce the tendons *r* of the flexor sublimis R, and continue their course onwards to the last phalanx, into the proximal extremity of which they are inserted by a radiated expanse. The radial margin of the muscle is closely attached to the flexor longus pollicis X, and the ulnar margin to the flexor carpi ulnaris S. Where the conjoint tendons run beneath the annular ligament, there is a bursa mucosa placed between the tendons and the bones of the carpus. Where the tendons lie in their vaginal ligaments, they are tied down to the bone by tendinous slips.*

The function of this muscle is to inflect thenad the carpus on the radius and ulna, the proximal phalanx on the metacarpal bones, the medial or second phalanx on the first or proximal, and the third or last or distal phalanx on the second or medial phalanx. This muscle also assists in inflecting the carpus ulnad.

Connected with the tendons of the flexor profundus, are four slender muscles, named lumbricales† m, which are



* Syn. Accessory ligaments of the flexor tendons. Tendinous frame.

The flexor digitorum profundus relat[illegible] proximal, medial, and distal joints of [illegible] ulna, metacarpal bones, and bones likewise involved in extirpation [illegible] these members.

† Syn. Musculi quatuor [illegible] musculi, post primum.

situated in the palm of the hand, and arise from the radial margins of these tendons as they emerge beyond the annular ligament U; they proceed spirally along, and as they run round the first phalanx, form elegant slender tendons, that are inserted into the broad tendinous expanse of the extensor digitorum communis D. At first they appear to be connected with the tendons of both the profundus and sublimis. Sometimes there are two to one finger, leaving one of the fingers deficient; and sometimes that to the little finger arises from the tendon of the ring-finger. The function of these muscles is to inflect thenad, and in some degree radiad the proximal or first phalanx on the metacarpal bones, and to assist in extending the second or medial phalanx on the first or proximal.*

The extensor communis digitorum manus† D, d, *d*, in *Fig.* 1 of Plate XII., is situated on the anconal aspect of the fore-arm, hand, and fingers, between the extensores carpi radiales H *h*, and the extensor carpi ulnaris B; it arises by a slender tendinous origin from the external or radial condyle of the os brachii, in conjunction with these muscles and the supinator brevis 55, descends in the middle of the fore-arm, dividing into four tendons, letters d, that run beneath the annular ligament U, onwards to the roots or proximal extremities of the first phalanx,

cundi. Flectentes primum internodium. [illegible] muscles lombricaux. Les palmi-phalangiens. Annuli-tendino-phalang[illegible]

* The lumbricales have little or n[illegible] very, being so slender as not to require [illegible] either [illegible] first joints of the fingers, or [illegible]

† Syn. [illegible] Primus manus externus muscu-[illegible] Extensor primus. Extensor digi-[illegible] tenseur des quatre doigts. L'exten-[illegible] Epicondylo-sus-phalangettien com-

7, 8, 9, 10, where each of them forms an elegant tendinous expanse *d*, which adhering to these bones, proceeds to the third or last phalanx, 16, 17, 18, 19. As the tendons, letters d, extend along the metacarpal bones, they become broad and flat, and are united to each other by transverse tendinous slips, ɒ: these tendons appear in this part sometimes double, especially that of the little finger, and hence some anatomists have made an extensor minimi digiti.* These tendons frequently run in distinct sheaths of the annular ligament u, where small bursæ mucosæ often occur.†

The function of this muscle is to extend the elbow-joint, the wrist-joint, and the three joints of the fingers; also to inflect the carpus ulnad.

There is a ligament, named intermuscular, on each side of the os brachii, extending from its condyles upwards or proximad along the ridges. The radial intermuscular ligament 25, in *Figs.* 1 and 2 of Plate XII., is more delicate than the ulnar intermuscular ligament 28, *Fig.* 2 of Plate XI. They separate the triceps from the muscles of the fore-arm; the ulnar separating the triceps from the pronator teres and flexors; and the radial ligament separating the triceps from the supinators and extensors.

The time for investigating the ligaments is whenever the muscles around a joint have been examined, that the relation of the one to the other may be understood.

* Syn. Decimus octavus digitos moventium. Secundus manus exterior musculus. Extensor proprius digiti auricularis. Extendentium secundus. L'extenseur propre du petit doigt. Extensor proprius digiti minimi. Epicondylo-sus-phalangettien du petit doigt.

† The extensor digitorum communis is concerned in dislocation of the elbow-joint, the wrist-joint, and the three joints of the fingers; also in fracture of the radius and ulna, and in extirpation of the metacarpal bones.

The ligaments of the elbow-joint, because this is of the ginglymoid class, must have lateral ligaments, besides a capsular ligament, which all joints possess. The lateral ligaments are naturally two, an external or radial, and an internal or ulnar. I shall begin with these, because they are most superficial, although evidently the capsular ligament, which is common to all joints, should be considered first, afterwards those which are peculiar to the joint.

The radial or external lateral ligament,* delineated in *Fig.* 2 of Plate XI., marked 45, extends between the external or radial condyle *q* of the os brachii, and the ulna, adhering in this course to the exterior surface of the capsular ligament 35, and embracing the head and neck of the radius. This ligament begins acutely from the condyle *q* of the bone of the arm, and radiates over the capsular ligament 35, to be attached to the ulna.†

Its use is to connect the radius to the os brachii and ulna, to protect the joint in this direction, and to limit in some degree pronation and supination, as also rotatory motion.

The ulnar or internal lateral ligament‡ 40, in *Fig.* 2 of Plate XI. extends obliquely between the ulnar or internal condyle *p* of the os brachii, and the coronoid process 3 of the ulna 1.§

The use of this ligament is to connect the ulna to the trochlear surface of the os brachii, and to protect

* Syn. Ligamentum brachio-radiale seu laterale externum. Ligamentum laterale externum cubiti.

† This ligament relates to dislocation of the elbow-joint, and to dislocation of the head of the radius backwards or anconad, the latter accident occurring only in children.

‡ Syn. Ligamentum brachio-ulnare seu laterale internum. Ligamentum laterale internum cubiti.

§ The ulnar lateral ligament relates to luxation of the elbow-joint.

the joint in this direction. It may be said also to limit the extension of the bones of the fore-arm; but the olecranon is a preventive to this motion: the ligament will prevent injury to the bones, and also rotatory motion.

The capsular ligament of the elbow-joint,* marked 35, in *Figs.* 2 and 3 of Plate XI., and in *Fig.* 2 of Plate XII., surrounds the smooth articular cartilaginous surfaces of the os brachii, ulna, and radius, which are opposed to each other. It adheres to the os brachii, close to the articular or trochlear surface laterally, but thenad and anconad it extends some way proximad, to give lodgement to the synovial glands, as delineated in *Fig.* 3 of Plate XI., marked 38, and in *Fig.* 2 of Plate XII. It closely surrounds the greater and lesser sigmoid cavities of the ulna 1, and includes the head and neck of the radius *a*, and here it is considerably thickened, and is named the coronary ligament† 5 of the radius, which is considered a distinct ligament, and described to be attached to each side of the lesser sigmoid cavity of the ulna, and to surround the smooth surface *d*, of the button-like head of the radius. In a bold muscular and ligamentous subject, if the extremity be putrescent, this ligament can be detached from the capsular 35. Exterior to the capsular ligament 35, in a strong muscular subject, a few oblique fibres are observed, as represented in *Fig.* 2 of Plate XI.‡

* Syn. Membrana capsularis cubiti. Synovial membrane. Synovial capsule.

† Syn. Annular or orbicular ligament of the radius.

‡ These ligamentous threads are considered by some distinct ligaments, and named anterior and posterior.

The capsular ligament is concerned in luxation of the elbow-joint. In page 76 of Part I. the different arts in which this joint is luxated are described; in all of them the capsular and lateral ligaments, as also some of the muscles surrounding

Synovial glands are found in both sigmoid cavities of the os brachii, and on each side of the greater sigmoid cavity of the ulna; indeed, wherever the blood-vessels have

the joint, are lacerated. Frequently the coronary and oblique ligaments are torn. Those muscles adhering to the ligament, as the brachieus internus, the supinator radii brevis, and the anconeus, cannot escape; while those which have freer motion may remain sound. When the ulna and radius are forced backwards or anconad, the coronoid process of the ulna occupying the place of the olecranon, the fore-arm, from the position of the bones, will be partially extended; the triceps, however, being relaxed, while the brachieus internus and biceps are much stretched and preternaturally excited, throw the arm into a semi-bent position; and because the radius is locked in its new situation, the hand remains supine, and cannot be pronated. The nature of the accident is readily understood from the preceding alterations, and from the projection of the ulna and radius anconad and proximad, also from a depression felt on each side of the olecranon, and a hard tumefaction on the thenal aspect of the joint caused by the trochlear extremity of the os brachii.

The same apparatus and directions as those described for the shoulder-joint in page 64, may be employed in luxations of this joint; but unless the patient be strong and muscular, bleeding is seldom requisite. The patient should be placed in the horizontal posture, either on the edge of a bed or sofa, and the apparatus applied around his fore-arm, with the towel over the shoulders of the operator, who places one of his knees against the os brachii, close to the elbow-joint, so that when extension begins, he may keep the ulna and radius as much removed as possible from the os brachii. Almost immediately after the operator begins extension, he may bend gently the fore-arm on the arm. When reduced, the fore-arm should remain inflected on the arm, and slung across the chest.

Luxation of the ulna and radius forwards or thenad occurs very seldom, and is always accompanied with fracture of the olecranon process of the ulna; therefore this kind of accident is at once ascertained. Extension for reducing it, and the keeping of the arm in the extended attitude, with bandaging from the trunk downwards to the olecranon, to keep its fractured points in apposition, is required in this accident.

The head of the radius alone is sometimes luxated forwards or thenad on the trochlear surface of the os brachii, resting partly on the coronoid process of the ulna, which accident is distinguished by the semi-bent position of the arm, the pronated state of the hand, and by the impossibility of either completely bending or extending the elbow-joint. As this luxation is with difficulty reduced, the patient should be placed on a bed or sofa, the same as in luxation of the shoulder-joint, a towel fixed around the wrist and hand, with the noose over the shoulders of the operator, who, as soon as the patient has fainted from bleeding, puts his heel into the axilla of the patient, and makes extension. When reduced, the arm

The ligamentum carpi annulare* u, in Plate X., in *Fig.* 1 of Plate XI., and in *Figs.* 1 and 2 of Plate XII. of Part V.; also in *Fig.* 2, Plate XII., and in Plate XIII. of Part III., is merely that portion of the fascia of the fore-arm, rendered thick and strong by the motions of the wrist-joint: this description is more applicable to its anconal than to its palmar portion, for the latter consists partly of a strong ligament stretched between the os trapezium on the radial side, and the os pisiforme and os unciforme on the ulnar side of the wrist. The various muscles attached to this ligament contribute to give it strength, while on the anconal aspect the muscles merely pass beneath, or are bound down by it; but from the extensor tendons running in distinct sheaths, the adhesion of these different ligaments to this annular, and to the carpal bones, renders it extremely strong. This latter peculiarity is displayed in *Fig.* 2 of Plate XII. Both sides of the annular ligament are connected with the fascia of the arm.†

The use of the annular ligament is to confine the flexor and extensor tendons like a pulley, to connect the carpal bones, and afford strength to the wrist-joint, and to the articulations of the various carpal bones.

them, when the operator saws both bones equally and at the same time, employing the saw as directed in that of amputation of the arm, in page 57. The arteries, as depicted and described in Part III., Plates XI. and XII., are now secured and treated as recommended in page 57. For the subsequent treatment, the reader is referred to the same page.

* Syn. Ligamentum anterius, annulare vel transversum carpi. Ligamentum carpi proprium, et ligamentum commune carpi dorsale.

† The annular ligament is concerned in sprains of the muscles, and in luxation of the wrist-joint; in the former, the quantity of lymph or mucous fluid effused is frequently so profuse, as to deceive surgeons for dislocation or fracture; and nothing but a knowledge of the anatomy of the parts will remove the deception. Leeches, with warm anodyne applications, should be employed to remove the acuteness of the pain and inflammation, and stimulating liniments with bandage to discuss the tumefaction.

The sacciform ligament* 62, in *Figs.* 2 and 4 of Plate XI., is a delicate capsular ligament surrounding the distal smooth cartilaginous surface 13, of the ulna, and the lesser sigmoid cartilaginous cavity of the radius, rendered strong by the annular and vaginal ligaments of the muscles in its contiguity, and possessing considerable strength near the capsular ligament of the wrist-joint. There is generally a small aperture close to the radius, that communicates with the capsule of the wrist-joint, so that they might be considered as one.† The use of this ligament is to bind these two points of bone in an articulation which assists in pronating and supinating the hand.

The wrist-joint in *Figs.* 2 and 4 of Plate XI., like all ginglymoid joints, has a capsular 63, and two lateral ligaments, 64 and 65. The lateral are a radial or external 65, and an ulnar or internal 64. The ulnar lateral ligament‡ 64, in *Figs.* 2 and 4, extends between the styloid process of the ulna 1, and the os cuneiforme *c* of the carpus, adhering to the exterior surface of the capsular ligament 63, but is more anconad than thenad.§

Its use is to connect the bones of the carpus to the ulna, to protect the wrist-joint laterally, and to limit rotatory motion.

* Syn. Membrana capsularis extremitatum inferiorum antibrachii. Membrana capsularis sacciformis.

† This ligament is concerned in luxation of the distal extremity of the ulna, which generally projects anconad, rupturing this ligament, and the ulnar lateral ligament of the wrist-joint, and forming a prominence on the anconal aspect of the wrist. The bone is with facility reduced to its former position, but requires to be bound down by a splint laid along the ulna, with a firm compress or pad over the distal head, and encircled with a roller firmly applied.

‡ Syn. Ligamentum cubitale. Ligamentum transversum. Ligamentum accessorium obliquum. Ulnar carpal ligament.

§ The ulnar lateral ligament is concerned in luxation of the wrist-joint; also in dislocation of the distal extremity of the ulna anconad.

The radial lateral ligament* 65, in *Figs.* 2 and 4, extends between the styloid process of the radius, and os scaphoides *a* of the carpus, adhering to the capsular ligament 63.†

Its use is to connect the bones of the carpus with the radius, to protect the wrist-joint laterally, and to limit rotatory motion.

The capsular ligament‡ 63, in *Figs.* 2 and 4, appears on first inspection to embrace all the bones of the carpus, the strong intertransverse oblique ligaments which extend between the carpal bones, and even between the radius and ulna to these bones, both on the thenal and anconal aspects, deceiving us; these can be with difficulty detached, in consequence of their close adhesion to the capsule. The capsular ligament surrounds the greater sigmoid cavity of the radius, and the smooth convex surfaces of the os scaphoides *a*, the os lunare *b*, and the os cuneiforme *c* of the carpus, also an interarticular cartilage *i*, at the extremity of the ulna 1, leaving a small hole of communication with the sacciform capsule; all these surfaces of bone are tipped with cartilage. There generally appears a partial division between the portion of the joint formed by the radius, the ossa scaphoides and lunare, and

* Ligamentum transversum. Radio-carpal ligament.

† The radial lateral ligament is concerned in dislocation of the wrist-joint, and in luxation of the radius alone, this bone being sometimes forced on the thenal aspect of the os scaphoides and os trapezium of the carpus, forming a large projection. The radial margin of the hand is forced anconad, and the ulnar margin thenad, giving the hand an awkward twisted appearance. Resistance being made either by the knee of the surgeon placed on the arm immediately proximad of the elbow-joint, or by an assistant grasping the arm, the operator lays hold of the hand, and gradually extends until the bones become opposed to each other, when the muscles pull the bones into their natural position.

‡ Syn. Membrana articuli cubiti et carpi capsularis. Synovial membrane. La capsule synoviale.

that by the interarticular cartilage and the os cuneiforme. The capsular ligament may therefore be said to adhere to the distal extremities of the radius and ulna on the one side, and the os scaphoides, os lunare, and os cuneiforme of the carpus on the other, supporting an interarticular cartilage between the ulna and cuneiforme bone. The cartilage is small, and is thicker on the ulnar than on the radial aspect.

A number of synovial glands are interspersed around this joint, apparently wherever the blood-vessels have quietness to form them. The oblique intertransverse ligaments on the thenal aspect are represented in Plate XI., and those on the anconal aspect in Plate XII. The use of the capsular ligament is to connect the carpus with the radius and ulna, and to confine the synovial fluid.*

* The carpal bones are forced either anconad or thenad on the radius and ulna, rupturing the capsular and lateral ligaments; the one anconad being the more common of the two. Both of these accidents are liable to be mistaken for sprains in this quarter, but the tumefaction on both sides of the carpus easily enables an intelligent surgeon to decide that the former is a luxation. When the carpal bones are forced anconad, besides the tumefactions just alluded to, there is a depression proximad of these bones, and the hand is inflected palmad. When the carpal bones are forced palmad of the radius and ulna, there is present the swelling on each side, but the depression is distad to the ends of the radius and ulna, and the fingers and hand are extended. In either case reduction may be accomplished in the same manner as when the distal extremity of the radius alone is luxated.

Occasionally the carpal bones are partially luxated radiad or ulnad, both of which species of accidents are easily distinguished, and with facility reduced.

The radius is frequently fractured near its distal extremity, accompanied with dislocation of the distal head of the ulna thenad on the os pisiforme. The hand is forced anconad on the radius and ulna, and the ulna is felt protruded beneath the tendon of the flexor carpi ulnaris: the fractured end of the radius is distinguished by the crepitus, the articular surface remaining connected with the carpus.

There is sometimes a compound dislocation of the ulna anconad, with a comminuted fracture of the radius, in which case it becomes a matter of consideration whether amputation should be performed immediately. If not deemed necessary, the loose bones may be extracted, the ulna cautiously reduced, and the hand and

The muscles of the thumb are eight in number, an abductor and an adductor, three flexors and three extensors, which I shall describe in the order of classification, as I have done the preceding muscles of the fore-arm. The muscles on the palmar or thenal aspect, when first exposed, appear one mass of carneous fibres, and require generally a little violence or art to separate them. The first that presents itself is the abductor pollicis manus* y, in Plate X. of Part V., also in *Fig.* 2, Plate XI. of Part III., situated on the thenal or palmar surface of the fleshy mass at the root of the thumb; arising from the annular ligament u and os trapezium, with fleshy fibres that ascend along the thumb and become tendinous, to be inserted into one of the sesamoid bones, or into the radial aspect of the root or proximal extremity of the first phalanx 6. This muscle almost entirely conceals the flexor ossis metacarpi pollicis 52, with which it is intimately connected at its origin, where it is partly tendinous; and it is connected at its insertion with the outer head Z of the flexor brevis pollicis.†

fore-arm immersed in a large poultice, which should be repeated every two hours. When all chance of inflammation has disappeared, the fractured ends of the radius should be put in apposition, and the limb supported with splints and bandage. See Part I. page 119. Occasionally the distal extremity of the radius is forced through the skin on the thenal aspect.—For further information on these accidents, consult Sir Astley Cooper's invaluable work on Dislocations and Fractures; Petit Traité des Maladies des Os, tome 1; Œuvres Chirurgicales de Desault par Bishat, tome 1; Boyer Traité des Maladies Chirurgicales, tome 4.

* Syn. Qui pollicem maxime abducit. Septimus extremæ manus musculus. Septimus. Pars thenaris. Abducens pollicem. Abductor pollicis. Abductor brevis pollicis manus. Abductores breves pollicis manus exterior et interior. Partie du thenar. Petit abducteur du pouce. Le court abducteur du pouce. Court adducteur du pouce. Carpo-sus-phalangien du pouce. Scapho-sus-phalangien du pouce.

† The abductor pollicis muscle is concerned in dislocation of the proximal extremity of the metacarpal bone of the thumb, and also in amputation of this finger.

The function of this muscle is to abduct the thumb from the other fingers, or to inflect the metacarpal bone and proximal phalanx thenad and ulnad.

The adductor pollicis manus* *w*, of Plate X., and in *Fig.* 1, Plate XI. of Part V., also in *Fig.* 2, Plate XII. of Part III., is situated deeply in the palm of the hand, beneath the flexor tendons, and appears as a part of the inner head *z* of the flexor brevis pollicis; it arises by a broad fleshy origin from the metacarpal bone of the middle finger, and proceeds with converging fibres to be inserted tendinous into one of the sesamoid bones, or the root or proximal extremity of the first phalanx. The manner of distinguishing between the adductor and the flexor brevis muscles, is to consider all those fibres which arise from the metacarpal bone of the middle finger as belonging to the adductor, and those that derive their origin from the carpal bones as belonging to the flexor brevis; then to trace and separate them to their insertions. Sometimes the adductor is very large, and the flexor small, or vicê versâ. The anconal surface of this muscle is connected with the interossei of the middle and fore-fingers, and the abductor indicis 70. The origin is delineated in *Fig.* 2 of Plate XI.†

The function of this muscle is to adduct the thumb to the fingers, or to inflect the metacarpal bone and first phalanx thenad and ulnad.

* Trium qui secundo pollicis ossi famulantur primus. Pars musculi pollicem flectentis volam versus. Secundus. Pars hypothenaris pollicis. Est haud dubie secundi internodii pollicis flexor primus. Pars flexoris primi et secundi ossis pollicis. Adductor (pollicis) ad minimum digitum. Pars ejus qui le meso-thenar. Métacarpo-phalangien du pouce. Metacarpo-phalanginien du pouce.

† The adductor is concerned in dislocation of the metacarpal bone from the os trapezium in dislocation of the first phalanx from the metacarpal bone, in amputation of the thumb, and in extirpation of the metacarpal bone of the middle finger.

The flexor ossis metacarpi pollicis,* dig. 52 of Plate X., and *Fig.* 1, Plate XI. of Part V., also in *Fig.* 2, Plate XII. of Part III., is situated immediately beneath the abductor pollicis Y, derives its origin from the os trapezium *e* and annular ligament U, and ascends with oblique fleshy fibres, that are inserted into the whole length of the metacarpal bone of the thumb. Its origin is partly tendinous but more carneous, and its distal margin is intimately connected with the outer head Z of the flexor brevis pollicis.†

The function of this muscle is to inflect the metacarpal bone thenad and ulnad; and also to rotate it ulnad.

The flexor brevis pollicis manus‡ Z, of Plate X., and Z, *z*, in *Fig.* 1 of Plate XI., of Part V., also in *Figs.* 2, Plates XI. and XII. of Part III., situated distad and centrad to the two last described muscles, is divided by anatomists into two portions; the outer or superficial or dermal head Z, derives its origin from the distal margin of the annular ligament U, ascends with longitudinal fibres, to

* Est illorum dúorum, qui pollicis primo ossi famulantur, primus. Decimus una cum undecimo. An et hic pars thenaria. Est primi internodii pollicis flexor secundus, cum primo. Pars flexoris primi et secundi ossis pollicis. Flexor primi internodii pollicis. Opponens pollicis manus. Partie du thenar. Métacarpien du pouce. L'opposant du pouce. Carpo-métacarpien du pouce. Carpo-phalangien du pouce.

† The flexor ossis metacarpi pollicis is concerned in dislocation of the proximal extremity of the metacarpal bone of the thumb, and likewise in amputation of this finger.

‡ Syn. Est trium, qui secundo pollicis ossi famulantur, secundus una cum tertio. Octavus extremæ manus musculus. Tertius cum quarto, et quinto, et sexto, et nono, forte et octavo. Haud dubie pars thenaris, cum parte hypothenaris pollicis. Secundi internodii pollicis flexor secundus, cum tertio et quarto. Pars flexoris primi et secundi ossis pollicis. Flexor secundi internodii pollicis. Partie des muscles: thenar, meso-thenar, et anti-thenar ou demi-inter-osseux du pouce. Le court fléchisseur du pouce. Petit fléchisseur du pouce. Carpo-phalangien du pouce. Carpo-phalanginien du pouce.

be inserted into the root of the first phalanx 6, or sesamoid bones. The deeper or central head *z* appears as part of the adductor pollicis *w*, being closely connected with it; is a bold fleshy bundle of fibres, deriving its origin from the os trapezium, trapezoides, magnum, and os unciforme of the carpus, and proceeding parallel with the fibres of the outer head Z, being separated by the tendon X of the flexor longus, and is inserted into the root of the first phalanx 6 and ossa sesamoidea.*

The function of this muscle is to inflect thenad and ulnad the metacarpal bone and first phalanx of the thumb.

The flexor longus pollicis manus† X, in Plate X., and in *Fig.* 1, Plate XI., of Part V., also in *Fig.* 2, Plate XII. of Part III., deeply situated near the radial margin of the palmar aspect of the fore-arm, running distad to the thumb, being concealed by the flexor carpi radialis r, and the flexor digitorum sublimis R, derives its origin from the radius, beginning a little distad to the tubercle *b*, and occupying three-fourths of its extent, and also from the interosseous ligament; it soon forms a strong round tendon that runs beneath the annular ligament U, around the os trapezium *e* to the thumb, where it passes, between the portions of the flexor brevis Z, z, bound down by a vaginal ligament, like the other long flexor tendons of the fingers, and is inserted into the second or last phalanx 15, of the thumb.

This muscle, besides the origin here described, has

* The flexor brevis pollicis is concerned in luxation of the metacarpal bone, in luxation of the first phalanx of the thumb, and in amputation of this finger.

† Syn. Tertius digitos moventium. Sextus manus interior musculus. Tertius musculus, pollici dicatus. Musculus a quo flectitur pollex. Tertii internodii pollicis flexor. Flexor tertii internodii, seu longissimus pollicis. Flexor tertii internodii. Le long fléchisseur du pouce. Grand fléchisseur du pouce. Radio-phalangettien du pouce.

generally either a fleshy or tendinous slip X, extending from the ulnar or internal condyle of the os brachii, to the origin from the radius, and at this part is intimately connected with the flexor sublimis R. The ulnar margin is so closely attached to the flexor profundus W, as to appear a part of the latter. Where the tendon runs round the trapezium *e*, there is a bursa mucosa.*

The function of this muscle is to assist in inflecting thenad the ulna and radius on the os brachii, the carpus on the bones of the fore-arm, and to inflect thenad and ulnad the metacarpal bone on the trapezium, the first phalanx on the metacarpal bone, and the second and last phalanx on the first.

The three extensors of the thumb, *a*, *b*, *c*, in *Figs.* 1 and 2, Plate XII., of Part V., and in Plate XIII. of Part III., are situated on the anconal aspect of the fore-arm and pollex, and at their origin are obscured by the extensor communis D; they are named extensor ossis metacarpi pollicis *a*, extensor primi internodii pollicis *b*, and extensor secundi internodii pollicis *c*; or they are termed extensores primi, secundi, et tertii internodii pollicis: the former appears the better, as there is a flexor ossis metacarpi, to antagonize the extensor ossis metacarpi pollicis.

The extensor ossis metacarpi pollicis† *a*, in *Figs.* 1 and 2, Plate XII., of Part V., and in Plate XIII. of

* The flexor longus pollicis is concerned in amputation of the fore-arm, in dislocation of the wrist-joint, and in dislocation of the metacarpal bone, first, and second phalanx of the thumb; also in amputation of this finger.

† Syn. Vigesimus secundus digitos moventium, una cum vigesimi-tertii portione, cujus tendo in primi pollicis ossis radicem implantatur. Quintus manus exterioris musculi. Secundi et tertii pollicis internodii extensoris. *Pars* superior *secundi extensoris* secundi extensoris pollicis. Pars extendentis pollicem. Extensor primi internodii ossis pollicis. Abductor longus pollicis manus. Extensor

Part III., the most proximal or the highest of the three extensors, derives its origin from the anconal aspect of the ulna, a little proximad to its middle, and from the interosseous ligament, descends spirally around the radius and the two radial extensors H, *h*, forming a strong tendon, that runs in a groove on the radial aspect of the distal extremity of the radius, and bound down by the annular ligament, to be inserted into the os trapezium and proximal extremity or root of the metacarpal bone 1. The proximal or upper margin of its origin is intimately connected with the supinator brevis 55, the distal with the extensor primi internodii pollicis *b*; as the muscle runs over the radius, it is attached to the bone, and the tendon is generally encased in a distinct sheath of the annular ligament U; where it runs in the groove of the radius, the tendon lies over that of the long supinator N.*

The function of this muscle is to inflect the carpus radiad, and the metacarpal bone of the thumb radiad and anconad.

The extensor primi internodii pollicis manus† *b*, in *Figs.* 1 and 2, Plate XII., of Part V., and in Plate XIII. of Part III., a much smaller muscle than the preceding,

primus pollicis. Partie du premier extenseur du pouce qui s'attache au bord de la base de la premiere phalange. Grand abducteur du pouce. Cubito-sus-métacarpien du pouce. Cubito-radi-sus-métacarpien du pouce.

* The extensor ossis metacarpi pollicis is concerned in dislocation of the wrist-joint, and in luxation of the proximal extremity of the metacarpal bone of the thumb from the trapezium; also in amputation of the metacarpal bone.

† Syn. Vigesimi tertii digitos moventium portio, cujus tendo in secundi ossis pollicis radicem inseritur. Quinti manus exterioris musculi. Pars inferior secundi et tertii pollicis internodii extensoris. Pars extendentis pollicem. Extensor secundi internodii ossis pollicis. Extensor secundi internodii. Extensor minor pollicis manus. Partie du premier extenseur du pouce qui s'attache sur la face convexe de la base de la seconde phalange. Le court extenseur du pouce. Petit extenseur du pouce. Cubito-sus-phalangien du pouce.

arises immediately distad or below, from the ulna, the interosseous ligament, and the radius, and runs round the latter, forming a slender tendon, which passes over the radial extensors H, *h*, in a sheath of the annular ligament U, and in a groove at the distal extremity of the radius to the thumb, advancing onwards to the proximal extremity of the first phalanx 6, where it expands like the tendons of the extensor communis D; the tendon sometimes proceeding along with that of the extensor secundi internodii *c*, onwards to the second or last phalanx 15. The origin of this muscle from the ulna is extremely small, and is obscured by the union of the extensor ossis metacarpi with the extensor secundi internodii pollicis.*

The function of this muscle is to inflect the carpus radiad, and the metacarpal bone and first phalanx radiad and anconad.

The extensor secundi internodii pollicis† *c*, in *Figs.* 1 and 2, Plate XII. of Part V., and in Plate XIII. of Part III., larger than the last described muscle, but not so much as the metacarpal extensor, derives its origin also from the anconal aspect of the ulna, distad or below the extensor primi internodii *b*, and from the interosseous ligament, descends longitudinally, forming a strong tendon, that runs apart from the other two extensors of the thumb, beneath the annular ligament U, and in a separate groove on the distal extremity of the radius, to the proximal ex-

* The extensor primi internodii pollicis is concerned in luxation of the wrist-joint, of the metacarpal bone with the trapezium, and of the metacarpal bone with the first or proximal phalanx.

† Syn. Vigesimus primus digitos moventium. Quartus manus exterior musculus. Pollicis tertium os extendens. Extendens pollicem alter. Extensor tertii internodii ossis pollicis. Extensor tertii internodii. Extensor major pollicis manus. Le second extenseur du pouce. Le long extenseur du pouce. Grand extenseur du pouce. Cubito-sus-phalangettien du pouce.

tremity of the first phalanx 6, where it forms an expansive tendon, that advances onwards to the second or last phalanx 15. The proximal or upper margin of the origin of this muscle is so connected with the extensor ossis metacarpi pollicis *a*, as to obscure the extensor primi internodii *b*. The distal or lower margin is connected with the indicator *f*.*

The function of this muscle is to extend the carpus, and the metacarpal bone, the proximal, and distal phalanx of the thumb, anconad and ulnad. It also assists in supinating the hand.

The metacarpal bone 1 of the thumb is articulated to the os trapezium *e*, by a capsular ligament *g*, strengthened exteriorly with strong longitudinal ligamentous bands,† as represented in *Figs.* 2 and 4 of Plate XI: in the latter figure, the capsular ligament is cut open, to show the trochlear surfaces of the trapezium and metacarpal bone, which, like other articular surfaces, are covered with cartilage.‡ The use of this capsular ligament is similar to

* The extensor secundi internodii pollicis is concerned in dislocation of the wrist-joint, in that of the three joints of the thumb, and in amputation of this finger.

† These ligamentous bands are by some named ligamentum dorsale, ligamentum palmare, ligamentum laterale externum, ligamentum laterale internum. I have never observed them so regularly placed on these four aspects as to deserve such important names.

‡ This articulation of the metacarpal bone of the thumb is luxated either thenad or anconad of the os trapezium; when thenad, there is a prominence in the palm of the hand, the finger is extended anconad, and cannot be inflected thenad; when luxated anconad, there is a projection on the anconal aspect of the wrist, the thumb is inflected thenad, and cannot be extended. From the great power of the flexor muscles, it appears necessary to have recourse to bleeding to syncope, whenever extension is to be commenced, and then reduction becomes extremely easy. That master of surgery, Sir Astley Cooper, directs the hand to be immersed previously in warm water for a considerable time, then a piece of thin leather soaked in water to be put round the first phalanx, and encircled with a loop of tape, in the form

that of the joints previously described; but these longitudinal ligamentous bands, as represented in *Fig.* 2, partly perform the function of lateral ligaments, by limiting the motions of this articulation.

The articulation between the metacarpal bone 1 and the first or proximal phalanx 6 of the thumb, as delineated in *Fig.* 2 of Plate XI., is completed by a capsular ligament *c*, and two lateral ligaments *k*; one only of the latter, however, is in view. The same arrangement pervades the joints between the other metacarpal bones and proximal phalanges, which are marked with the same letters; and the same ligamentous structure joins the distal articulations of the fingers and thumb, therefore only those of the thumb have been drawn. The capsular ligament *c*, as well as all those of the other articulations of the fingers, surrounds the smooth cartilaginous surfaces forming the joints, and answers the same purpose as the capsular ligaments already described. The radial lateral ligament *k*, the opposite of which or ulnar does not come into view, is remarkably strong, and extends parallel with the finger, from the radial little tubercle at the side of the distal extremity of the metacarpal bone 1, to a similar tubercle at the side of the proximal extremity of the first phalanx 6, adhering to the capsular ligament in its course.*

of the sailor's 'clove hitch,' the tape being about two yards in length. With this, extension is to be made when the patient has fainted, endeavouring to relax the flexors by bending the finger gently thenad, counter extension being applied between the thumb and fore-finger. In compound dislocation of this joint, the thumb appears capable of being saved, provided the tendons, particularly that of the flexor longus pollicis, and that of the extensor secundi internodii pollicis, are sound. The treatment is the same as that described under compound dislocation of the wrist-joint. Consult Sir Astley Cooper's work on Fractures and Dislocations; Boyer Maladies Chirurgicales, tome 4; Petit Traité des Maladies des Os, tome 1.

* The first phalanx is liable to be luxated from the metacarpal bone, either thenad or anconad, both of which are at once distinguished. The same means,

This performs the same function as in those joints where these ligaments prevail, as in the wrist and elbow. The capsular ligament of the second or last joint of the thumb is marked *m*, and one of the lateral ligaments *n*; and as they precisely resemble those last described, it appears unnecessary to particularize them further.

The muscles peculiar to the fore-finger are an abductor and an extensor, the latter of which is named indicator. The indicator* *f*, in *Fig.* 2 of Plate XII., situated on the anconal aspect of the distal half of the fore-arm, hand, and fore-finger, and concealed by the extensor digitorum communis D, derives its origin from the greater extent of the distal half of the ulna, and from the contiguous interosseous ligament; descends longitudinally along the fore-arm, soon becoming tendinous, and running along

excepting the bleeding, may be employed as for the luxation of the metacarpal from the carpal bone. The articulation between the first and second phalanx, or between the proximal and medial, is more subject to be luxated, than the joint formed by the medial and distal phalanx. In this the medial phalanx is generally dislocated thenad of the first or proximal phalanx, and is at once distinguished. Reduction is to be accomplished as in the preceding. In compound dislocation, the same observations and treatment are applicable, as in those detailed under that of the metacarpal bone of the thumb. When amputation is deemed requisite at any of the joints of the fingers, it should be performed with two semi-elliptical incisions, their extremes meeting anconad and thenad, and their convexities pointing distad. Each incision should extend as deep as possible at once, and the operator ought to divide, in his third sweep with the knife, one of the lateral ligaments, and then the joint is dislocated. The knife can now be easily carried round the proximal extremity of the bone to be removed, dividing tendons and capsular ligament, and the other lateral ligament, with one or two sweeps. The lips of the wound can be neatly approximated and kept together simply by a little lint, with a bandage rolled round all the fingers.

* Syn. Decimus nonus digitos moventium. Tertius manus exterior musculus. Indicatorius. Indicem abducens. Indicis abductor. Extensor indicis seu indicator. Extensor secundi internodii indicis proprius vulgo indicator. L'extenseur propre de l'index. L'extenseur propre du doigt indicateur. Extenseur de l'index. Cubito-sus-phalangettien de l'index.

with the tendons of the extensor communis beneath the annular ligament U to the first phalanx 2 of the fore-finger, where its tendon unites with that of the communis to contribute to the formation of the tendinous expanse spread over the phalanges.* The radial margin is connected with the extensor secundi internodii pollicis *c*, and the ulnar margin of the muscle with the extensor carpi ulnaris B. The tendon runs parallel on the ulnar aspect of the tendon of the extensor communis to the fore-finger.

The function of this muscle is to extend the carpus and fore-finger, the latter of which it not only inflects anconad, but a little ulnad.

The abductor indicis manus† 70, in *Fig.* 1 of Plate XII., situated between the metacarpal bones of the thumb and fore-finger, on the anconal aspect, is a flat muscular mass, arising from the os trapezium and metacarpal bones of the thumb and fore-finger, and meeting in a central line to form a strong short tendon which is inserted into the radial aspect of the proximal extremity of the first phalanx, and expansive tendon of the indicator and extensor communis.‡

The function of this muscle is to abduct the fore-finger from the middle and other fingers, and also to inflect the proximal or first phalanx of the fore-finger thenad.

The muscles of the little finger, like those of the thumb,

* The indicator relates to amputation of the fore-arm, to dislocation of the wrist-joint, to that of the joints of the fore-finger, and to amputation of this finger.

† Syn. Alter musculus, lateralibus pollicis motibus inserviens. Septimus pollicis musculus. Primus. Abductor indicis. Adducens pollicem. Adductor pollicis. Le demi-interosseux de l'index.

‡ The abductor indicis relates to dislocation of the metacarpal bone of the thumb from the os trapezium, to dislocation of the first phalanx of the fore-finger from its metacarpal bone, to extirpation of the metacarpal bone, and amputation of the proximal phalanx.

appear to constitute one fleshy mass, and require equal violence or art to separate them; they are represented in Plate X. and in *Fig.* 1, Plate XI. of Part V., also in *Fig.* 2, Plate XII. of Part III. The flexor parvus 52 is the most superficial and palmar; the abductor 51 is nearly as superficial, but is situated on the ulnar margin of the little finger; while the adductor 55 is partly concealed by the flexor and abductor.

The flexor parvus digiti minimi manus* 52, Plate X. of Part V., also in *Fig.* 2, Plate XII. of Part III., arises from the annular ligament u and os unciforme, and is inserted into the proximal extremity, or base or root of the first phalanx. The origin of this muscle is partly fleshy and partly tendinous; and so also is its insertion, the latter of which is sometimes also inserted into the distal extremity or head of the metacarpal bone. The origin and insertion are represented in *Fig.* 1 of Plate XI.† The deep twig of the ulnar nerve pierces this and the adductor muscles, as seen in Part III., Plate XII., *Fig.* 2.

The function of this muscle is to inflect thenad the proximal phalanx of the little finger.

The abductor digiti minimi manus‡ 51, in Plate X. of Part V., and in *Fig.* 2, Plate XII. of Part III., de-

* Syn. Pars sexti extremæ manus musculus. Pars hypothenaris parvi digiti. Pars abductoris minimi digiti. Abductor minimi digiti, hypothenar. Flexor proprius digiti minimi. Le court fléchisseur du petit doigt. Partie du carpo-phalangien du petit doigt. Second carpo-phalangien du petit doigt.

† The flexor parvus digiti minimi relates to luxation and amputation of the proximal phalanx of the little finger.

‡ Syn. Vigesimus manus digitos moventium. Sextus extremæ manus musculus. Pars hypothenaris parvi digiti. Minimum digitum abducens. Pars abductoris minimi digiti. Extensor tertii internodii minimi digiti. Hypothenar du petit doigt, ou le petit hypothénar. Abducteur du petit doigt. L'adducteur du petit doigt. Carpo-phalangien du petit doigt.

rives its origin from the os pisiforme T, and the contiguous point of the annular ligament U; runs along the ulnar aspect of the little finger, to be inserted by a strong tendon into the proximal extremity or root of the first phalanx. The origin is partly fleshy and partly tendinous; both it and the insertion are represented in *Fig.* 2 of Plate XI.*

The function of this muscle is to inflect thenad and also ulnad the proximal phalanx of the little finger.

The adductor minimi digiti† 55, in Plate X., and in *Fig.* 1, Plate XI. of Part V., lies beneath the two preceding muscles, with one of which, the flexor parvus 52, it is closely connected; derives its origin from the annular ligament U, and the os unciforme *h*; proceeds with oblique fibres to be inserted into the ulnar and somewhat anconal margin of the metacarpal bone of the little finger.‡

The function of this muscle is to inflect the metacarpal bone of the little finger thenad and radiad.

Between the metacarpal bones on the back of the hand, or on the anconal aspect, there are three little muscles, named interossei externi,§ seen in *Figs.* 1 and 2, Plate

* The abductor minimi digiti has the same relation to surgery that the flexor parvus has.

† Illorum octo, qui quatuor subserviunt digitis, parvum digitum flectentium primus. Unus octo aliorum musculorum. Unus illorum octo, qui inter ossa metacarpi continentur. Pars hypothenaris parvi digiti. Interosseus ultimo ossi metacarpi parte manus externa adhærens. Pars abductoris minimi digiti. Flexor primi internodii minimi digiti. Adductor ossis metacarpi digiti minimi. Metacarpien. Le muscle opposant du petit doigt. Carpo-metacarpien du petit doigt. Adductor ossis metacarpi digiti auricularis.

‡ The adductor minimi digiti relates to extirpation of the metacarpal bone of the little finger.

§ Sunt tres illorum octo, qui quatuor subserviunt digitis. Octo aliorum musculorum. Illorum octo, qui inter ossa metacarpi continentur. Interossei. In-

XII., marked *m*, *n*, o; each of them arises by a double origin from the opposite sides of the metacarpal bones, which unite in the centre, and form at the head or distal extremity of these bones a delicate tendon, which advances along the side of the first phalanx, to which it adheres, and joins the expansive tendon of the extensor communis near the head or distal extremity of the same phalanx. One of the three, named prior medii,* is marked *m*, and its tendon runs along the radial margin of the first phalanx 8 of the middle finger.†

Its function is to inflect radiad and thenad the first or proximal phalanx, and also to contribute to extend the medial and distal phalanges.

Another, named posterior medii,‡ is marked *n*, has a similar origin, and its tendon runs along the ulnar margin of the middle finger, to have a similar insertion.§

Its function is to inflect ulnad and thenad the proximal phalanx, and to extend the medial and distal phalanges.

The third, denominated posterior annularis,‖ is marked *o*, has also a similar origin and insertion as the other two, its tendon running along the ulnar margin of the ring-finger.¶

terossei manus. Les inter-osseux externes, ou dorsaux, ou posterieurs. Metacarpo-phalangien latéraux sus-palmaires. Sous-métacarpo-lateri-phalangiens. Interossei externi digitorum manus. Anconal interossei. Interossi externi seu bicipites seu dorsales. Metacarpo-phalangei laterales.

* Syn. Anconi-radialis digiti medii.

† The prior medii relates to extirpation of either the metacarpal bone 3 of the middle finger, or that 2 of the fore-finger, and to dialocation as well as amputation of the first or proximal phalanx of the middle finger.

‡ Syn. Anconi-ulnaris digiti medii.

§ This interosseus has nearly the same relation to surgery that the preceding has.

‖ Syn. Anconi-ulnaris digiti annularis.

¶ This interosseus muscle relates to extirpation of either the metacarpal bone 4 of the ring-finger, or to that 5 of the little finger; and also to dislocation and amputation of the proximal phalanx of the ring-finger.

Its function is to inflect ulnad and thenad the proximal phalanx, and to extend the medial and distal phalanges.

On the thenal or palmar aspect of the hand there are corresponding muscles, termed interossei interni,* that arise from single metacarpal bones, and form slender tendons, which are inserted into the expansive tendon of the extensor communis of the same fingers; these are represented in *Fig.* 2, Plate XI., and are named prior indicis *p*, posterior indicis *q*, prior annularis s, interosseus auricularis *t*: but I have generally found more, viz. a prior medii *u* and posterior medii *v*, and a posterior annularis *x*.

Prior indicis† *p*, in *Fig.* 2 of Plate XI., situated on the radial margin of the metacarpal bone 2 of the fore-finger, and concealed between the adductor pollicis *w* and abductor indicis 70, as represented in *Fig.* 1, derives its origin from the radial and palmar aspect of the metacarpal bone 2 of the fore-finger, and runs along the same aspect of the first joint; then becoming tendinous, is inserted first into the proximal extremity of the first phalanx, and secondly by an expansive tendon into that of the extensor digitorum communis.‡

Its function is to inflect radiad and thenad the proximal phalanx of the fore-finger, and to extend the medial and distal phalanges.

Posterior indicis§ *q*, in *Fig.* 2 of Plate XI., is almost entirely obscured by the prior medii *u* on the thenal

* Sunt quatuor illorum octo, qui quatuor subserviunt digitis. Octo aliorum musculorum. Illorum octo qui inter ossa metacarpi continentur. Interossei. Interossei manus. Interossei interni vel palmares. Les interosseux internes, ou palmaires, ou antérieurs. Metacarpo-phalangiens latéraux palmaires. Sous-metacarpo-lateri phalangiens. Metacarpo-phalangei laterales.

† Syn. Vola-radialis indicis.

‡ The prior indicis relates to extirpation of the metacarpal bone of the fore-finger, and to dislocation as well as amputation of the first phalanx.

§ Syn. Vola-ulnaris indicis.

aspect, and is situated on the ulnar and palmar aspect of the metacarpal bone 2 of the fore-finger, deriving its origin from the same aspect of the metacarpal bone of the fore-finger, and running with a small tendon around the first joint, to be inserted into the expansive tendon of the extensor communis.*

Its function is to inflect ulnad and thenad the proximal phalanx of the fore-finger, and to extend the medial and distal phalanges.

Prior annularis† *s*, in *Fig.* 2 of Plate XI., situated on the radial margin of the palmar aspect of the metacarpal bone 4 of the ring-finger, arises from the same aspect of this bone, and becomes tendinous at the first joint, around which it runs, to be inserted into the expansive tendon of the extensor communis.‡

Its function is to inflect radiad and thenad the proximal phalanx of the ring-finger, and to extend the medial and distal phalanges.

Interosseus auricularis§ *t*, in *Fig.* 2 of Plate XI., is situated on the radial margin of the metacarpal bone 5 of the little finger, on the palmar aspect, deriving its origin from the same surface of that bone, along which it runs, and becomes tendinous at the first joint, to be inserted into the proximal extremity of the first phalanx, on the radial aspect, and afterwards into the expansive tendon of the extensor communis.‖

* The posterior indicis has the same relation to surgery that the prior indicis has.

† Syn. Vola-radialis digiti annularis.

‡ The prior annularis is concerned in extirpation of the metacarpal bone of the ring-finger, and in dislocation as well as amputation of the proximal phalanx.

§ Syn. Vola-radialis digiti auricularis.

‖ The interosseus auricularis relates to extirpation of the metacarpal bone of the little finger, and to amputation and dislocation of the proximal phalanx.

Its function is to inflect radiad and thenad the proximal phalanx of the little finger, and to extend the medial and distal phalanges.

The carpal bones are connected together by capsular and intertransverse ligaments, the latter being exterior to the former. The intertransverse ligaments† are represented in *Figs.* 2 and 4 of Plate XI., and *Fig.* 2 of Plate XII., marked thus *. They extend between the different carpal bones both on their thenal and anconal aspects, and adhere to the capsules that surround the smooth surfaces of these bones.‡ They bind these bones firmly together, so as to limit their motion, and prevent dislocation.

The capsular ligaments are observed in *Figs.* 2 and 4 of Plate XI, beneath the intertransverse *; they include the separate articulations formed by the carpal bones, being attached around the smooth cartilaginous surfaces. A ginglymoid joint is formed by the trapezium, trapezoides, magnum, and unciform, on the one hand; and by the scaphoides, lunar, and cuneiform, on the other: the scaphoides plays on the trapezium and trapezoides, while

† Syn. Ligamenta ossium carpi brevia. Ligamenta obliqua, vel transversa. Anterior, posterior, lateral and accessory ligaments.

‡ The intertransverse ligaments relate to dislocation of one or more of the carpal bones, which is a very rare occurrence; also to extirpation of one of these bones. When the os magnum is luxated anconad, which is almost the only bone of the carpus that is forced out of its situation, there is a marked protuberance anconad. Extension of the hand, and afterwards pressure on this bone, will reduce it; but here is a difficulty of keeping the os magnum in its situation; a compress and roller require to be worn for a long period. The os scaphoides has been dislocated from its carpal connexions, together with fracture of the distal extremity of the radius. Compound dislocation of the carpal bones is more frequent, and then one or more require removal, or amputation becomes necessary. For further information on these accidents, see Petit Traité des Maladies des Os, tome 1; Boyer Traité des Maladies Chirurgicales, tome 1; and Sir Astley Cooper on Fractures and Dislocations.

the magnum on the scaphoid and lunar, and again the cuneiform on the unciform.

The carpal bones are tied to the metacarpal bones by intertransverse * * and capsular ligaments,† as represented in *Fig.* 2 of Plate XII. The same arrangement being present on the thenal aspect.‡ The proximal extremities of the metacarpal bones are bound together by intertransverse ligaments.

THE

MUSCLES

OF THE

LOWER EXTREMITY.

THESE may be examined, either as they occur in the order of dissection, or in the arrangement of classification;

† Syn. Ligamenta articularia. Ligamenta dorsi manûs, lateralia, recta, perpendicularia. Ligamenta ossis metacarpi digiti indicis sunt tria; ligamentum sublime, ligamentum profundum, et ligamentum laterale. Ligamenta ossis metacarpi digiti medii sunt quinque; duo sublimia, unum profundum, alterum perpendiculare, quintum obliquum. Ligamenta ossis metacarpi digiti annularis sunt duo; unum membrana capsularis, alterum lacertus ligamenti inter os magnum et os unciforme. Ligamentum ossis metacarpi digiti auricularis unum est, peculiareque validum. Ligamens étroits et minces.

‡ The proximal extremities of the metacarpal bones are so firmly tied to the carpal by ligaments, and most of them so locked with these bones by their osseous angles, that they are very seldom luxated, but generally so injured, that amputation of one or more of them becomes necessary.

and since the former of these two naturally comes first, and as there is no necessity for entirely detaching any muscle, until we arrive at the investigation of the ligaments, all the muscles can and should be first explored in the order of presentation, and afterwards examined in classes. This method is much the better, as it imprints the muscles on the mind, not only in an anatomical, but in a physiological and surgical view.

Beneath the integuments on the anterior, or patellar or rotular aspect of the thigh, the fascia lata is found, and is depicted in Plate XV. of Part III., and in Plates I., II., and III. of Part IV. This is a strong thick aponeurosis connected with the muscles of the trunk, and from thence descending along the thigh, the muscles of which, as also those of the nates, it surrounds, thus forming an envelope or sheath from the trunk to the knee. The same fascia can be traced distad, enveloping the muscles of the leg downwards to the toes. We shall merely consider at present that portion situated on the patellar aspect of the thigh, which is by far the most important, deferring the description of the rest for Part VI.

In the Plates of the Part above alluded to, this fascia, consisting of strong interlaced tendinous fibres, is observed to be divided into two portions, where it is connected with the tendon B of the external oblique muscle of the abdomen: these are marked D, K, and after a short extent distad, form a uniform surface. The portion K is named iliac, is intimately connected with the tendinous fibres B of the external oblique muscle, as represented in Plate I. of Part IV., and with those fibres of the same muscle, marked 3, in Plate II. of the same Part; and is elevated above the pubic portion D, in consequence of the psoas magnus and iliacus internus muscles, together with the anterior crural nerve 22, artery T, and vein U, emerging

from the abdominal cavity over the bones of the pelvis, as delineated in Plate XVI. of Part III. The pubic portion D, into which is inserted that portion 3 of the tendon of the external oblique muscle denominated Gimbernat's ligament, closely invests the pectinalis P and adductor longus g muscles, and continues in its descent distad on the thigh, below the level of the iliac portion K, till the psoas magnus K and iliacus internus W muscles, together with the nerve, artery, and vein, begin to dip centrad in the thigh, the muscles to the trochanter minor, and the nerve and blood-vessels, to run beneath or centrad of the sartorius muscle E. These portions generally unite a little distad of the junction of the saphena major vein *b*, and trunk of the crural vein U, and form a continuous circular tendinous expanse round the thigh and leg.

Where the loose edge of the iliac portion looks pubic and tibiad, it is named falciform,* and by that profound surgeon, Dr. Burns of Glasgow, is supposed to form frequently the cause of stricture in crural hernia.† The fascia lata is thinner in some parts than in others, for example, the pubic portion is often removed by the dissector, as well as that which covers the sartorius muscle E: while that over the rectus I, and around to the popliteal aspect, is very strong.

The use of the fascia lata is to bind the muscles, so as to afford them greater power in moving the limb, acting in some measure as a pulley, particularly at the knee

* Syn. Crescentic. Semi-lunar. Femoral ligament.

† The fascia lata relates to hernia, either inguinal or crural, as described in Part IV., pages 4 and 9; and also to crural aneurism, as in Part III., pages 108 and 110. In Plate XIII. of Part V., Gimbernat's ligament 3 is very conspicuous, in consequence of being drawn from a female subject; and we can easily comprehend, from its breadth, what relief will be afforded by its division pubic in strangulated crural hernia.

and ankle-joints, where it is thickest. It also affords origin to some of the muscles of the thigh, and insertion to others; and likewise protects the blood-vessels.

The muscle which acts on this fascia, named tensor vaginæ femoris,* is delineated in Plates XV. and XVI. of Part III., marked K; likewise in Plate XIII. of Part V., and XVI. of Part VI. The muscular fibres are enveloped in layers of the fascia, and situated between the sartorius E of Plate XV., and gluteus medius i of Plate XVII. of Part III.; they arise partly tendinous and partly fleshy between these two muscles, from the exterior aspect of the crista of the os ilium, and therefore contiguous to the anterior superior spinous process of that bone, as delineated in Part I. Plate VIII. *Fig.* 2, letter *d*; thence descending distad, poplitead and fibulad, they terminate a little below the trochanter major, in the tendinous expanse of the fascia lata. The fascia here is remarkably strong, and continues so downwards or distad to the patella and head of the fibula, which may be said to be points of its insertion; the fascia lata is also strongly attached to the linea aspera of the os femoris, and to the tibia.

The function of this muscle is to render tense this fascia, to bend and abduct the thigh on the pelvis, to rotate the limb tibiad, and to extend or bend the tibia on the os femoris.† When the os femoris is the fixed point, it likewise assists in inflecting the trunk fibulad, and rotating it round by the sternal aspect.

* Syn. Est pars carnea sexti tibiam moventium. Eadem sexti tibiæ musculi. Membranosi. Extendentium tibiam primi, membranosi, musculus lati tendinis. Fascia lata femoris. Muscle aponévrotique, ou muscle de la bande large, ou muscle de fascia lata. Tenseur aponévrotique crural. Ilio-aponévrosi-fémoral.

† The relation of the fascia lata to surgery has been already noticed. The muscular portion is concerned in luxation of the hip-joint, in amputation at the hip-joint, in fracture of the neck and shaft of the os femoris, and in morbus coxarius.

The sartorius muscle* E, in Plates XV., XVI., XVII., and XX., of Part III., and in Plates XIII. and XIV. of Part V., and in *Fig.* 1, Plate XX. of Part VI., is an elegant arrangement of parallel muscular fibres, extending spirally along the thigh, between the os ilium and the tibia, and situated immediately beneath or centrad to the fascia lata. It derives its origin chiefly tendinous from the anterior superior spinous process C of the os ilium, runs with parallel fleshy fibres spirally around the patellar aspect of the thigh, superficially to the rectus, vastus internus, and triceps, to the popliteal aspect of the internal or tibial condyle of the os femoris, round which it runs forming a flat tendinous expanse, that is inserted into the head of the tibia distad and poplitead to its tubercle, superficially to the gracilis and semi-tendinosus, the expanse uniting with the fascia of the leg. In Plate XV. of Part III., the muscle is represented in its natural situation. In Plates XIII. and XIV. of Part V., the origin is distinctly delineated. In Plate XVI. of Part III., the muscle is observed proceeding around the tibial condyle of the os femoris, and forming its tendinous expanse, the insertion of which is seen in Plate XX. of the same Part, covering the tendons of the gracilis Q, and semi-tendinosus M muscles, between which a bursa mucosa is generally found, as represented in Plate XX. Part VI. marked *e*.

The function of the sartorius is to inflect and abduct the thigh on the pelvis, and to rotate the limb tibiad; to inflect the tibia on the os femoris, and when bent to rotate it slightly.† When the thigh bone is fixed, it assists

* Syn. Primus tibiam moventium. Primus tibiæ musculus. Longus sive sutorius. Flectentium tibiam primus, sartorius, fascialis, fascia. Le couturier. Ilio-prétibial. Ilio-créti-tibial.

† The sartorius muscle relates to the securing of the superficial femoral artery, as described in Part III., p. 110; to amputation at the hip-joint, as detailed in

to inflect the trunk fibulad, and to rotate it round by the sternal aspect.

The gracilis muscle* Q, depicted in Plates XVI., XVII., and XX. of Part III., and in Plates XIII. and XIV. of Part V., also in Plate XX. of Part VI., is an elegant slender muscle, situated on the tibial aspect of the thigh, extending between the pubes and tibia. It derives its origin by a broad tendinous lamina from the os pubis, parallel with its symphysis, which soon becomes fleshy, and descending along the tibial aspect of the thigh, becomes tendinous at the inner or tibial condyle of the os femoris, behind or poplitead to which it runs, to be inserted, together with the sartorius muscle, into the head of the tibia, distad and poplitead to its tubercle. The origin is distinctly seen in Plates XIII. and XIV. of Part V., having the adductor longus g on its iliac side, and overlapping the adductor brevis g, and adductor magnus G, in its descent along the ramus of the os pubis. The point of bone from which this muscle arises is seen in *Figs.* 1 and 2, Plate III. of Part I., marked m. The insertion is represented in Plates XX. of Parts III. and VI.; in that of Part III. the sartorius E covers it, while in that of Part VI. the tendon is exposed, and observed to be surrounded with the bursa mucosa *e*.

The gracilis is a flexor and adductor of the thigh, also a rotator tibiad; it is likewise a flexor of the leg on the thigh; and when the thigh is made a fixed point, assists

the same Part, p. 111; to dialocation of this joint, to morbus coxarius, to fracture of the neck and body of the os femoris, and to amputation of the thigh. It is also concerned in amputation of the leg, in dialocation and other injuries of the knee-joint.

* Syn. Secundus tibiam moventium. Secundus tibiæ musculus. Posticus gracilis. Flectentium tibiam secundus, gracilis. Le droit ou grêle interne. Droit interne crural. Sous-pubio-prétibial. Sous-pubio-crêti-tibial.

in inflecting the trunk tibiad, and in turning it round by the sternal aspect.*

The triceps adductor femoris G, g, g, in Plates XVI. and XVII. of Part III., in Plates XIII. and XIV. of Part V., and in Plate XVI. of Part VI., is a bold muscular mass, forming the greater portion of the flesh on the inside, or tibio-patellar aspect of the thigh, and is situated between the gracilis Q, and the pectinalis P, in this view, while on the popliteal aspect it is partially concealed by the hamstring muscles L, M, N, and the gluteus maximus F, as represented in Plate XVII. of Part III. It is, strictly speaking, three distinct muscles, and hence divided into the adductor longus, adductor brevis, and adductor magnus.

The adductor longus femoris† g, situated the most dermal or superficial of the three adductors, on the patello-tibial aspect of the proximal half of the thigh, between the gracilis Q and the pectinalis P, and resting on the adductor brevis g, so as to conceal it from view, derives its origin from the body of the os pubis, immediately sacrad to the crista t, descends obliquely downwards and inwards or distad and poplitead to the linea aspera of the os femoris, to be inserted into its middle third. The origin is clearly defined in Plate XIII. of Part V., between the gracilis Q and pectinalis P, with which it is on the same parallel; and the insertion is observed in this Plate, and Plate

* The gracilis is concerned in luxation of the hip-joint, in amputation at this joint, as described in Part III. page 111; in morbus coxarius, in fracture of the neck and shaft of the os femoris, in amputation of the thigh; and also in amputation of the leg, and in luxation and other injuries of the knee-joint.

† Syn. Pars octavi femur moventium. Fortasse pars septimi femoris musculi. Pars prima quinti femur moventium. Primum caput tricipitis. Pars flectentium tertii tricipitis. Pars tricipitis. Adductor femoris primus. Premier muscle du triceps. Le premiere adducteur de la cuisse. Moyen adducteur. Pubio-fémoral. Spini-pubio-fémoral.

XIV., to unite with that of the other two adductors, to form their tendon g, through which the superficial femoral artery t, and vein u, are piercing.*

The function of this muscle is to bend the thigh on the pelvis, to adduct the one limb to the other, and to rotate the limb fibulad, or outwards. When the os femoris is the fixed point, this muscle assists in inflecting the trunk tibiad, and turning it round by the dorsal aspect.

The adductor brevis femoris† *g*, situated beneath or centrad to the adductor longus g, and concealed by it and the gracilis Q, derives its origin from the body of the os pubis, descends obliquely downwards and inwards, or distad and poplitead, and is inserted into the upper or proximal third of the linea aspera of the os femoris. In Plates XIII. and XIV. of Part V., the precise origin and insertion of this muscle are distinctly defined, and the latter is observed uniting with the insertions of the other two adductors, to form their tendon g. In Plate XIII., the adductor brevis is seen descending parallel with the fibres of the pectinalis P.‡

The function of this muscle is the same as that of the longus, a flexor, an adductor, and a rotator fibulad of the thigh; and when the os femoris is the fixed point, it assists in inflecting the trunk tibiad, and turning it round by the dorsal aspect.

* The adductor longus femoris relates to luxation of the hip-joint, to fracture of the neck and shaft of the os femoris, to morbus coxarius, and to amputation at the hip-joint, as described in Part III. p. 111.

† Syn. Pars quinti femur moventium. Pars octavi femoris musculi. Secunda pars quinti femur moventium. Alterum caput tricipitis. Pars flectentium tertii. Pars tricipitis. Adductor femoris secundus. Second muscle du triceps. Le second adducteur. Petit adducteur. Sous-pubio-fémoral.

‡ The adductor brevis femoris has the same relation to surgery that the adductor longus has.

The adductor magnus femoris* G, situated poplitead of the other two adductors, derives its origin from the ramus of the os pubis, ramus and tuberosity of the os ischium, and descends with transverse and oblique fibres poplitead, to be inserted into the whole length of the linea aspera of the os femoris, its tendon uniting with those of the adductor longus and brevis, becoming smaller and rounder, to be ultimately inserted into the tubercle poplitead to the tibial condyle of the os femoris, the superficial femoral artery t and vein U, running between this tendon and the bone. The precise origin of this muscle is distinctly seen in Plate XIV. of Part V., and the surface of bone in Plate VIII., *Fig.* 2, of Part I. The superior or proximal fibres, which run transversely, are parallel and in contact with those of the quadratus femoris K, with which they are liable to be confounded, as observed in Plate XVII. of Part III., and in Plate XVI. of Part VI.†

The function of this muscle varies according to the fibres which are called into action: thus, those arising from the ramus of the os pubis and os ischium are flexors and adductors, while those deriving origin from the tuberosity of the os ischium are extensors. The whole muscle is a rotator fibulad. When the os femoris is the fixed point, this muscle inflects the trunk tibiad, and turns it round by the dorsal aspect.

The pectinalis muscle‡ P,§ in Plate XVI. of Part III.,

* Syn. Pars quinti femur moventium. Pars octavi femoris musculi. Tertia pars cum quarta quinti moventium femur. Tertium caput tricipitis. Pars flectentium tertii, tricipitis. Pars tricipitis. Adductor femoris tertius cum quarto. Troisieme muscle du triceps. Troisieme adducteur. Grand adducteur. Ischio-fémoral. Ischio-pubi-fémoral.

† The adductor magnus femoris has the same relation to surgery that the adductor longus or brevis has.

‡ Syn. Pars octavi femur moventium: Septimus femoris musculus. Pectineus. Flectentium quartus. Le pectiné. Sus-pubio-femoral. Pubio-fémoral.

§ From an inadvertency scarcely to be avoided, two letters P have crept into

and in Plates XIII. and XIV. of Part V., situated in the proximal third of the patellar aspect of the thigh, between the adductor longus g, and the junction of the psoas magnus κ, and iliacus internus W, muscles, derives its origin from the os pubis between the linea-ileo-pectinea and the acetabulum, and descends obliquely centrad and poplitead, to be inserted into the superior tibial division of the linea aspera, immediately distad to the trochanter minor *f*. The surface of bone from which this muscle arises, is seen in Part I. Plate III. *Figs.* 1 and 2, marked g, and the surface of insertion in Plate VIII. *Fig.* 4, marked a.* The function of the pectinalis is to bend and adduct the thigh, and to rotate the limb fibulad. When the os femoris becomes the fixed point, it inflects the trunk tibiad, and rolls it round by the dorsal aspect.

The psoas magnus has occasionally an appendix, named psoas parvus, which is situated within the abdominal cavity, dorsad of the peritoneum, extending along the lumbar vertebræ and brim of the pelvis. This muscle, the psoas parvus,† delineated in Part II. Plate V., marked M, is a slender muscle, deriving a fleshy origin from the sides of the bodies of the two atlantal lumbar vertebræ, along which, and superficially or sternad to the psoas magnus κ, it descends, forming a long tendon, that expands at the brim of the pelvis, to be inserted into the linea-ileo-pectinea, where the os ilium joins the os pubis. The function of this muscle is to inflect sternad and pubic the spinal column on the pelvis; and when only one muscle acts, it inflects the trunk dextrad or sinistrad. When the

these plates: the one contiguous to the adductor longus g, and adductor brevis *g* is the pectinalis.

* The pectinalis has the same relation to surgery that the adductor longus or brevis has.

† Syn. Psoas minor. Prélombo-pubien. Pré-lumbo-pubien.

lumbar vertebræ are the fixed points, this muscle will assist in elevating the pelvis to the vertebræ.

The psoas magnus muscle* K, in Plates V. and VI. of Part II., in Plate IV. of Part IV., and in Plate XIII. of Part V., situated on the sternal or abdominal aspect of the lumbar vertebræ and brim of the pelvis, is a large round fleshy mass, deriving its origin from the sides of the bodies and transverse processes of the last dorsal, and all the lumbar vertebræ, and descending along the brim of the pelvis to emerge from the abdominal cavity beneath Paupart's ligament, where it unites with the iliacus internus W, to be inserted into the trochanter minor *f* of the os femoris. This muscle is surrounded with a strong envelope of cellular or tendinous expanse, which unites with that of the iliacus internus muscle.† The origin is partly

* Syn. Femur moventium sextus. Quintus femoris. Lumbaris sive psoas. Lumbalis musculus. Psoas magnus seu lumbalis. Psoas major. Le psoas ou lombaire interne. Prélombo-trochantinien. Pré-lumbo-trochantin.

† The psoas magnus muscle, in consequence of this strong envelope of cellular substance, which is, strictly speaking, nothing more than what is common to all muscles, gives a direction to the matter that is secreted in the region of the lumbar vertebræ, when one or more of them become carious; hence the matter confined by the sheath of the muscle gravitates to the region of the groin, where it is first perceptible to the practitioner. The symptoms of this disease are pain in the region of the lumbar vertebræ, increased on motion, particularly in walking, but this is sometimes so very obscure, that the disease is not evident, until rigors are present, with a tumefaction in the groin. The matter sometimes gravitates under the fascia lata of the thigh, and sometimes into the pelvis, and emerges at the great sacro-ischiadic notch. This disease does not always originate in the vertebræ.

When the disease is ascertained, a small opening is to be made with a lancet, in the protruding point; previously retracting the skin, that it may afterwards act as a valve, when all the matter is evacuated. The skin is then brought together with adhesive plaister, and tried to be healed at once; and a roller applied round the upper part of the thigh and abdomen. In a day or two afterwards, a caustic eschar is to be made in the region of the lumbar vertebræ; but the caustic should never be applied with the intention of keeping the surface open with peas and issue ointment; on the contrary, the part should be healed as quickly as possible,

fleshy and partly tendinous, and the muscle is pierced in several places by the lumbar nerves, and by those of them which form the anterior crural nerve. The external iliac artery and vein lie upon the muscle in its progress along the pelvis, to its emergence from the abdomen.* A bursa mucosa is generally found beneath the junction of this muscle and the iliacus internus muscle, as they proceed over the pelvis and capsular ligament of the hip-joint, to the latter of which these muscles firmly adhere. The bursa is marked 1, in Plate XIV. of Part V. The insertion into the trochanter minor *f*, is also seen in this Plate, and so incorporated with that of the iliacus internus w, that it cannot be separated.

The function of the psoas magnus is to bend and adduct the thigh on the pelvis, and to rotate the limb fibulad. When the os femoris is fixed, it inflects the trunk sternad and pubic, and when only one muscle acts, it inflects the trunk dextrad or sinistrad, and rolls it round by the dorsal aspect.

The iliacus internus muscle† W, in Plates XIII. and XIV. of Part V., and in Plate XVI. of Part III., and also in Plates V. and VI. of Part II., situated within the

as the virtues of the caustic depend on the inflammation, not on the suppuration, it produces; and hence, whenever the one eschar falls off, and the part heals, another should be made; on which account the actual is preferable to this potential cautery. The same observations are applicable to morbus coxarius. The diet should be light and nutritive, and the patient much exposed to the open air in a carriage. When matter again collects, the same treatment becomes necessary, repeating the application of the cautery more frequently.

* The psoas magnus muscle is also concerned in the securing of either the common iliac, or the external iliac, or the internal iliac arteries, as described in Part II., pages 25 and 33; in luxation of the hip-joint, in morbus coxarius, in amputation at the hip-joint, as described in Part III. p. 111; and in fracture of the neck of the os femoris.

† Syn. Septimus femur moventium. Sextus femoris. Iliacus. L'iliaque. Iliaco-trochantinien. Iliaco-trochantin.

abdominal cavity dorsad of the peritoneum, occupying the venter of the os ilium, from all of which it arises, as also from the transverse process of the last lumbar vertebra, and sometimes from the os sacrum; the fibres descend out of the pelvis, beneath Paupart's ligament, where they unite with the psoas magnus, and continue to descend, to be inserted into the less trochanter *f*, and contiguous part of the linea aspera of the os femoris, adhering to the capsular ligament A of the hip-joint in their course. The insertion is very clearly defined in Plate XIV. A strong tendinous fascia, named iliaca, covers this muscle, and unites with that of the psoas magnus and that of the transversalis muscle, so as to shut up the abdominal cavity, and prevent the more frequent occurrence of hernia.*

The function of the iliacus internus is to bend and adduct the thigh on the pelvis, and to rotate it fibulad: and when the thigh is the fixed point, this muscle will inflect the trunk tibiad, and rotate it round by the dorsal aspect.

There are four muscles situated on the patellar aspect of the thigh, and all of them connected with the patella; they are the rectus femoris, the crureus, the vastus internus, and the vastus externus.

The rectus femoris† I,‡ in Plate XVI. of Part III., and in Plates XIII. and XIV. of Part V., situated on the pa-

* The iliacus internus muscle relates to luxation of the hip-joint, to fracture of the neck of the os femoris, to morbus coxarius, and to amputation at this joint, as described in Part III. p. 111.

† Syn. Nonus tibiam moventium. Nonus tibiæ musculus. Rectus gracilis. Extendentium tibiam secundus, rectus. Rectus. Rectus cruris. Le droit, ou grêle antérieur. Droit antérieur crural. Ilio-rotulien.

‡ From an inadvertency scarcely to be avoided, two letters I have come into the plates of this Part. The I indicating the rectus is contiguous to the letters F, which mark the crureus, and to the letter L that points out the vastus internus; the examination, however, of Plate XVI. of Part III. first, where only one I is present, will at once render it clear.

tellar aspect of the thigh, immediately beneath the fascia lata, extending from the pelvis to the patella, is a bold penniform muscle, arising from the anterior inferior spinous process *t* of the os ilium, and descending along the thigh, to be inserted into the proximal point of the patella Y, together with the crureus P, the vastus internus L, and the vastus externus O. The origin of this muscle is tendinous, and derives some threads from the dorsum of the os ilium, as represented in Plate XIV., marked *i*; as the muscle descends, it becomes more and more carneous, the tendon running between the bundles of fibres to give it the penniform appearance. The insertion is a strong tendon, intimately united with the vasti and crureus; and beneath or centrad to the insertion there is a bursa mucosa, marked 1 in *Fig.* 2, Plate XIX. of Part VI.*

The function of this muscle is to bend the thigh on the pelvis, and to extend the leg on the thigh.

The vastus internus muscle† L, in Plate XVI. of Part III., and in Plates XIII. and XIV. of Part V., situated on the tibial aspect of the thigh, partially covered by the rectus I and the sartorius E muscles, and strongly adhering to the fascia lata, derives its origin from the tibial edge of the whole length of the linea aspera of the os femoris, patellad to the insertions of the psoas magnus K and iliacus internus W, the pectinalis P, and the three adductors g, g, G; runs with oblique fibres downwards,

* The rectus femoris relates to luxation of the hip-joint, to fracture of the neck and shaft of the os femoris, to amputation at the hip-joint, as detailed in Part III. p. 111; to amputation of the thigh, to fracture of the patella, and to dislocation and other injuries, as well as diseases of the knee-joint.

† Syn. Pars octavi tibiam moventium. Pars octavi tibiæ musculi. Pars extendentium tibiam quarti, vasti interni. Le vaste interne. La partie interne du triceps crural. La partie interne du crural. Tri-fémoro-rotulien. Tri-fémoro-tibi-rotulien.

that adhere to the os femoris, and which are inserted or incorporated with the crureus P, the rectus I, and lastly into the tibial margin of the patella Y.*

The function of this muscle is to extend the tibia on the os femoris, together with the rectus, crureus, and vastus externus, through the medium of the patella.

The vastus externus muscle† O, in Plate XVI. of Part III., situated on the fibular aspect of the thigh, partly concealed by the rectus I, and entirely covered by the tensor vaginæ femoris K, derives its origin from the fibular edge of the whole length of the linea aspera of the os femoris, and runs with oblique fibres downwards to be inserted or incorporated with the crureus P, the rectus I, and into the fibular edge of the patella Y. The fascia lata, together with the cellular envelope of the two vasti muscles, which is remarkably strong, and with which it is incorporated, runs over the patella Y and its ligament *y*, to be inserted into the tibia and fibula, as represented in Plate XIX. of Part VI., marked *l*, *o*.‡ The function of this muscle is to extend the tibia on the os femoris through the medium of the patella, together with the rectus, crureus, and vastus internus.

The crureus muscle§ P, placed between L and O in Plate XVI. of Part III, and in Plates XIII. and XIV. of

* The vastus internus muscle relates to amputation of the thigh, to fracture of the patella, and to luxation and other injuries, as well as diseases of the knee-joint.

† Syn. Septimus tibiam moventium. Septimus tibiæ musculus. Extendentium tibiam tertius, vastus externus. Le vaste externe. La partie externe du triceps crural. Tri-fémoro-rotulien. Tri-fémoro-tibi-rotulien.

‡ The vastus externus muscle has the same relation to surgery that the vastus internus has.

§ Syn. Pars octavi tibiam moventium. Pars octavi tibiæ musculi. Extendentium tibiam quarti, vasti interni. Femoreus. Crureus seu femoreus. Cruralis. Le crural. Le triceps crural. Crural. Tri-fémoro-rotulien. Tri-fémoro-tibi-rotulien.

Part V., is situated on the patellar aspect of the thigh, beneath or centrad to the rectus I, and between the vasti muscles L, O, by which it is completely hid. It arises from the patellar surface of the os femoris, commencing between the trochanters, and descending adhering to the bone and the two vasti muscles, to be inserted into the patella Y. This muscle is merely the central fibres of these two vasti, and properly considered as one muscle by Sabatier and others. Near its insertion the bursa mucosa 1 in Plate XIX. of Part VI., is situated beneath or centrad between the tendon and the bone.*

The function of this muscle is the same as that of the two vasti.

* The crureus has the same relation to surgery that the vastus internus or externus has.

INDEX

OF

THE LETTERS OF REFERENCE

IN

SUPPLEMENT TO PART IV.

PLATE I.

A, Symphysis pubis
B, Paupart's ligament
C, Anterior superior spinous process of os ilium
E, Sartorius muscle
G, Internal oblique muscle
I, Transversalis muscle
K, Iliac portion of fascia lata
P, Pectinalis muscle
S, Crista of os ilium
T, Common femoral artery
U, Common femoral vein
W, Iliacus internus muscle

a, Cremaster muscle
f, Tendinous expanse of external oblique muscle
g, Adductor longus muscle
i, Tendon of transversalis muscle
t, Superficial femoral artery

v, Vas deferens

a, Spermatic cord
b, Saphena major vein truncated
f, Linea alba
g, Adductor brevis muscle
g, Spermatic arteries
i, Iliac portion of fascia transversalis

g, Spermatic vein
f, Pubic portion of fascia transversalis

1, Upper pillar of external aperture of inguinal canal
2, Lower pillar of external aperture of inguinal canal
3, Gimbernat's ligament
22, Anterior crural nerve

PLATE II.

A, Symphysis pubis
B, Os sacrum
C, Os coccygis
I, Transversalis muscle
O, Common iliac vein
P, Common iliac artery
R, Rectus muscle
T, External iliac artery
U, External iliac vein
V, Internal iliac artery
W, Fascia iliaca
X, Internal iliac vein
Y, Abdominal aspect of crural aperture

v, Vas deferens
x, Epigastric artery

a, Peritoneum
d, Obturator artery
g, Spermatic arteries
i, Iliac portion of fascia transversalis
x, Epigastric vein

𝔇, Obturator vein
𝔤, Spermatic veins
𝔦, Pubic portion of fascia transversalis

1, Internal aperture of inguinal canal
2, Lumbar vertebræ
21, Obturator nerve

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART V.

THE MUSCLES OF THE UPPER AND LOWER EXTREMITIES.

PLATE VIII.

A, Clavicle
B, Deltoid muscle
C, Origin of pectoralis major muscle
D, Pectoralis minor muscle
E, Near A indicating clavicle, is the sterno-cleido-mastoideus muscle
E, Near F is latissimus dorsi muscle
F, Teres major muscle
G, Long head of triceps muscle
H, Axillary artery
I, Subscapularis muscle
K, Coraco-brachialis muscle
M, Subclavius muscle
O, Serratus magnus muscle
Z, External intercostal muscles

a, Ribs
b, Insertion of deltoid muscle
d, Posterior circumflex artery
c, Insertion of pectoralis major muscle
d, Insertion of pectoralis minor muscle
e, Sternum
l, Long head of biceps flexor cubiti muscle

t, Capsular ligament of shoulder-joint
l, Short head of biceps flexor cubiti muscle

1, Capsular ligament of sternal articulation of clavicle
2, Interarticular cartilage of sternal articulation of clavicle
3, Capsule of cartilage of rib
4, Ligamentous expanse between clavicle and scapula
5, Coracoid process of scapula

PLATE IX. *Fig.* 1.

A, Clavicle
B, Origin of deltoid muscle
C, Clavicular origin of pectoralis major muscle
D, Acromion scapulæ
E, Insertion of latissimus dorsi and teres major muscles
I, Subscapularis muscle
K, Coraco-brachialis muscle
L, Biceps flexor cubiti muscle
M, Brachieus internus muscle
N, Supinator radii longus muscle
P, Flexor carpi radialis muscle

b, Insertion of deltoid muscle
g, Triceps muscle
i, Insertion of subscapularis muscle
l, Fascia of biceps muscle
a, Bursa mucosa beneath the deltoid muscle
c, Insertion of pectoralis major muscle
d, Insertion of pectoralis minor muscle
l, Long head of biceps muscle

l, Short head of biceps muscle

λ, Tendinous insertion of biceps muscle

5, Coracoid process of scapula
6, Ligamentum proprium anticum scapulæ
8, Ligamentum trapezoideum
9, Scapulary articulation of clavicle
66, Supra-spinatus muscle
80, Insertion of trapezius muscle
81, Infra-spinatus muscle

Fig. 2.

A, Clavicle
B, Origin of deltoid muscle
D, Acromion scapulæ
E, Insertion of latissimus dorsi and teres major muscles
G, Long head of triceps muscle
K, Coraco-brachialis muscle
O, Insertion of serratus magnus muscle

b, Insertion of deltoid muscle
e, Supra-scapular artery
g, Second head of triceps muscle
i, Tendinous insertion of subscapularis muscle
a, Proper posterior ligament of scapula
b, Superior costa of scapula
c, Contiguous to b, indicates insertion of pectoralis major muscle, which compare with *Fig.* 1.
c, Contiguous to *t*, is head of os brachii
e, Glenoid cavity of scapula
i, Origin of subscapularis muscle
l, Long head of biceps muscle

t, Capsular ligament of shoulder-joint

PLATE IX. *Fig.* 2. (*Continued.*)

5, Coracoid process of scapula
6, Ligamentum proprium anticum scapulæ
8, Ligamentum trapezoideum
66, Insertion of supra-spinatus muscle

Fig. 3.

A, Clavicle
B, Sterno-thyroideus muscle
C, Sterno-hyoideus muscle

a, Ribs

e, Sternum

1, Capsular ligament of sternal articulation of clavicle
7, Inter-clavicular ligament
10, Rhomboid ligament

PLATE X.

H, Extensor carpi radialis longior muscle
I, Pronator radii teres muscle
L, Biceps muscle
M, Brachieus internus muscle
N, Supinator radii longus muscle
P, Flexor carpi radialis muscle
Q, Palmaris longus muscle
R, Flexor digitorum sublimis muscle
S, Flexor carpi ulnaris muscle
T, Os pisiforme
U, Annular ligament
V, Fascia palmaris
W, Flexor digitorum profundus muscle
X, Flexor longus pollicis muscle
Y, Abductor pollicis muscle
Z, Flexor brevis pollicis muscle

m, Insertion of brachieus internus muscle
r, Tendons of flexor digitorum sublimis muscle
w, Tendons of flexor digitorum profundus muscle

a, Extensor ossis metacarpi pollicis muscle
b, Extensor primi internodii pollicis muscle
h, Extensor carpi radialis brevior muscle
r, Divided tendons of flexor digitorum sublimis muscle
w, Adductor pollicis muscle

ϖ, Lumbricales muscles

λ, Tendon of biceps muscle

PLATE X. (*Continued.*)

2, Bursæ mucosæ of biceps muscle
6, Situated on thumb indicates proximal phalanx of thumb
6, Near 16, indicates trunk of spiral nerve
15, Distal phalanx of thumb
16, Cutaneous branch of spiral nerve
26, Deep branch of spiral nerve
30, Vaginal ligaments of flexor tendons of fingers
50, Pronator quadratus muscle
51, Abductor minimi digiti muscle
52, Near 51, is flexor parvus minimi digiti muscle
52, Near y, is flexor ossis metacarpi pollicis muscle
54, Palmaris brevis muscle
55, Near v, is adductor minimi digiti muscle
55, Near bursæ mucosæ 2, indicates supinator radii brevis muscle
70, Abductor indicis muscle

PLATE XI. *Fig.* 1.

M, Brachieus internus muscle
N, Tendon of supinator radii longus muscle
P, Tendon of flexor carpi radialis muscle
S, Flexor carpi ulnaris muscle
T, Pisiform bone
U, Annular ligament of carpus
W, Flexor digitorum profundus muscle
X, Flexor longus pollicis muscle
Z, Flexor brevis pollicis muscle

m, Insertion of brachieus internus muscle
r, Tendons of flexor digitorum sublimis muscle
w, Tendons of flexor digitorum profundus muscle

b, Tubercle of radius
e, Os trapezium
h, Os unciforme
r, Divided tendons of flexor digitorum sublimis muscle
w, Adductor pollicis muscle
z, Inner head of flexor brevis pollicis muscle

g, Tendinous insertion of triceps muscle
m, Lumbricales muscles

6, Proximal phalanx of thumb
15, Distal phalanx of thumb
30, Vaginal ligaments of flexor tendons of fingers
34, Intertransverse ligaments of heads of metacarpal bones
50, Pronator quadratus muscle
51, Points of attachment of abductor minimi digiti muscle

PLATE XI. *Fig.* 1. (*Continued.*)

52, Near T, Points of attachment of flexor parvus minimi digiti muscle
52, Near P, Flexor ossis metacarpi pollicis muscle
55, Near 51, Adductor minimi digiti muscle
55, Near *b*, Supinator radii brevis muscle
70, Abductor indicis muscle

Fig. 2.

P, Tendinous insertion of flexor carpi radialis muscle
T, Os pisiforme

m, Tendinous insertion of brachieus internus muscle

a, Radius
e, Os trapezium
g, Capsular ligament of articulation between os trapezium and metacarpal bone of thumb
h, Os unciforme
m, Capsular ligament of distal articulation of thumb
n, Lateral ligament of distal articulation of thumb
p, Near 40, is ulnar condyle of os brachii
p, Near *k*, indicates prior indicis muscle
q, Near *k*, is posterior indicis muscle
q, Near 45, is radial condyle of os brachii
s, Prior annularis muscle
t, Interosseous auricularis muscle
u, Prior medii muscle
w, Origin of adductor pollicis muscle
x, Posterior annularis
e, Capsular ligaments of proximal articulations of fingers

λ, Tendinous insertion of biceps muscle

1, Near 61, Ulna
1, Near *g*, Metacarpal bone of thumb
2, Metacarpal bone of fore-finger
3, Metacarpal bone of middle finger
3, Near m, Coronoid process of ulna
4, Metacarpal bone of ring-finger
5, Metacarpal bone of little finger
6, Proximal phalanx of thumb
15, Distal phalanx of thumb
25, Ulnar intermuscular ligament
30, Vaginal ligaments of flexor tendons
35, Capsular ligament of elbow-joint
40, Ulnar lateral ligament of elbow-joint
45, Radial lateral ligament of elbow-joint
50, Pronator quadratus muscle

PLATE XI. *Fig.* 2. *(Continued.)*

60, Oblique ligament
61, Interosseous ligament
62, Sacciform ligament around distal head of ulna
63, Capsular ligament of wrist-joint
64, Ulnar lateral ligament of wrist-joint
65, Radial lateral ligament of wrist-joint

Fig. 3.

a, Radius
d, Head of radius

λ, Tendinous insertion of biceps muscle

1, Ulna
3, Coronoid process of ulna
5, Coronary ligament of elbow-joint
35, Capsular ligament of elbow-joint
38, Synovial gland

Fig. 4.

T, Os pisiforme

a, Os scaphoides
b, Os lunare
c, Os cuneiforme
e, Os trapezium
g, Capsular ligament of articulation between trapezium and metacarpal bone of thumb
h, Os unciforme
i, Interarticular cartilage

1, Metacarpal bone of thumb
13, Distal head of ulna
62, Sacciform capsule
63, Capsular ligament of wrist-joint
65, Radial lateral ligament of wrist-joint

PLATE XII. *Fig.* 1.

B, Extensor carpi ulnaris muscle
D, Extensor communis digitorum muscle
E, Anconeus muscle
H, Extensor carpi radialis longior muscle

PLATE XII. *Fig.* 1. *(Continued.)*

N, Supinator radii longus muscle
S, Flexor carpi ulnaris muscle
U, Annular ligament of carpus

d, Tendons of extensor digitorum communis muscle
g, Triceps muscle

a, Extensor ossis metacarpi pollicis muscle
b, Extensor primi internodii pollicis muscle
c, Extensor secundi internodii pollicis muscle
d, Tendinous expanse of extensor digitorum communis muscle
h, Extensor carpi radialis brevior muscle
m, Prior medii muscle
n, Posterior medii muscle
o, Posterior annularis muscle
q, Radial condyle of os brachii
w, Adductor pollicis muscle
v, Connecting tendons of extensor digitorum communis

2, Metacarpal bone of fore-finger
5, Metacarpal bone of little finger
6, First phalanx of thumb
7, First phalanx of fore-finger
8, First phalanx of middle finger
9, First phalanx of ring-finger
10, First phalanx of little finger
12, Ulna
15, Last phalanx of thumb
16, Third phalanx of fore-finger
17, Third phalanx of middle finger
18, Third phalanx of ring-finger
19, Third phalanx of little finger
25, Radial intermuscular ligament
70, Abductor indicis muscle

Fig. 2.

B, Extensor carpi ulnaris muscle
D, Origin of extensor digitorum communis muscle
E, Anconeus muscle
H, Points of attachment of extensor carpi radialis longior muscle
N, Origin of supinator radii longus muscle
S, Flexor carpi ulnaris muscle
U, Annular ligament of carpus

a, Extensor ossis metacarpi pollicis muscle
b, Extensor primi internodii pollicis muscle
c, Extensor secundi internodii pollicis muscle
f, Indicator muscle
h, Points of attachment of extensor carpi radialis brevior muscle
m, Prior medii muscle
n, Posterior medii muscle
o, Posterior annularis muscle

e, Capsular ligaments of proximal joints of fingers
g, Insertion of triceps muscle
h, Lateral ligaments of proximal joints of fingers

PLATE XII. *Fig.* 2. *(Continued.)*

1, Metacarpal bone of thumb
2, Metacarpal bone of fore-finger
3, Metacarpal bone of middle finger
4, Metacarpal bone of ring-finger
5, Metacarpal bone of little finger
6, Near g, is olecranon ulnæ
6, Proximal phalanx of thumb
7, Proximal phalanx of fore-finger
8, Proximal phalanx of middle finger
9, Proximal phalanx of ring-finger
10, Proximal phalanx of little finger
15, Distal phalanx of thumb
25, Radial intermuscular ligament
35, Capsular ligament of elbow-joint
55, Supinator radii brevis muscle

* * Intertransverse ligaments of carpal bones

PLATE XIII.

B, Paupart's ligament
C, Anterior superior spinous process of os ilium
D, Part of pubic portion of fascia lata
E, Origin of sartorius muscle
G, Adductor magnus muscle
I, Contiguous to K and E, indicates gluteus medius muscle
I, Contiguous to P, indicates rectus femoris muscle
K, Near E, Tensor vaginæ femoris muscle
K, Near f, Psoas magnus muscle
L, Vastus internus muscle
P, Contiguous to D, indicates pectinalis muscle
P, Between I and L, indicates crureus muscle
Q, Pectinalis muscle
T, Common femoral artery
U, Near T or t, indicates femoral vein
U, At the top of the Plate, indicates umbilicus
W, Iliacus internus muscle

f, Tendon of external oblique muscle
g, Adductor longus muscle
t, Superficial femoral artery

f, Linea alba
g, Adductor brevis muscle

t, Spine of os pubis
g, Tendon of triceps muscle
t, Crista pubis

1, Upper pillar of abdominal ring
2, Lower pillar of abdominal ring
3, Gimbernat's ligament

PLATE XIV.

A, Capsular ligament of hip-joint
C, Anterior superior spinous process of os ilium
D, Obturator externus muscle
E, Origin of sartorius muscle
G, Adductor magnus muscle
I, Contiguous to K and E, indicates gluteus medius muscle
I, Contiguous to A and L, indicates rectus femoris muscle
K, Insertion of psoas magnus muscle
L, Vastus internus muscle
N, Semi-membranosus muscle
P, P, Contiguous to g, g, indicate origin and insertion of pectinalis muscle
P, Between I and L, indicates crureus muscle
Q, Origin of gracilis muscle
V, Femoral vein
W, Insertion of iliacus internus muscle

d, Obturator vein
g, g, Origin and insertion of adductor longus muscle
t, Superficial femoral artery

d, Obturator artery
f, Trochanter minor
g, *g*, Origin and insertion of adductor brevis muscle
i, Part of origin of rectus femoris muscle
t, Anterior inferior spinous process of os ilium

g, Tendon of triceps muscle

1, Bursa mucosa of psoas magnus and iliacus internus muscles
21, Obturator nerve

EDINBURGH:
Printed by John Brewster,
11, Society.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.E.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND PHYSIOLOGY, EDINBURGH.

PART VI.—MUSCLES AND JOINTS OF THE LOWER EXTREMITY.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, LONDON; AND

HODGES AND M'ARTHUR, DUBLIN.

1824.

EDINBURGH:
Printed by John Brewster,
11, Society.

TO

JOHN BURNS, M. D. C. M.,

PROFESSOR OF SURGERY IN THE UNIVERSITY OF GLASGOW;

IN ADMIRATION OF THOSE EMINENT ABILITIES,

SO CONSPICUOUSLY DISPLAYED IN HIS WRITINGS,

WHICH HAVE ENLIGHTENED THE PROFESSION,

AND EXTENDED HIS FAME BOTH AT HOME AND ABROAD,

THIS PART IS INSCRIBED,

BY

HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART VI.

MUSCLES AND JOINTS

OF THE

LOWER EXTREMITY.

PREFACE.

THE Author is rejoiced to find, that, since he brought the state of Anatomical instruction in this country under public notice, in his Preface to Part II., many of the public prints, and one scientific individual,* have espoused the cause, which he was the first to advocate; and he earnestly hopes that the time is not far distant, when the public will feel it a duty incumbent on them, to step forward and provide the necessary means for so important an object. Scarcely a year passes by, without some of the learned professional boards enacting a law, that dissection is an indispensable study. The Medical Commissioners of the Navy, for instance, a body of enlightened scientific men, sensibly feeling the great responsibility which attaches to the medical

* An Appeal to the Public and to the Legislature, on the necessity of affording dead bodies to the schools of Anatomy, by legislative enactment. By William Mackenzie, professor of anatomy and surgery, Glasgow.

officers who are to take charge of the lives of our undaunted heroes, have lately decreed that twelve months' dissection is necessary for every candidate who shall present himself for admission into the naval service.

The Patrons and Professors of the University of Edinburgh are said to have in contemplation some important alterations in the course of study preparatory to graduation; and they have already very properly appended to it midwifery. It still remains to be seen, what other amendments will be adopted. Hitherto dissection has been considered unnecessary for either a medical degree or a surgical diploma* of Edinburgh. Whether this arises from the conviction of these learned bodies, that dissection cannot be prosecuted either legally or surreptitiously in this city, or that candidates can qualify themselves by grinding and practising on the living, without having recourse to the dead, it is not for me to decide. A lecturer in this city, who stands pre-eminent in the profession, viewing the proposed alterations in a proper light, has suggested some valuable improvements, in a pamphlet lately pub-

* Within these twelve months, the College of Surgeons of Edinburgh enacted a law, that Materia Medica shall be one of the necessary studies for candidates; as if Materia Medica was of more importance to a surgeon than dissection.

lished.* My own opinion is, that let the improvements be what they may, so long as a knowledge of anatomy acquired by dissection, is not made the ground-work of physic, the reputation of this University must soon sink;† for, "if there be a fault in general education, it is the sending out from our Universities, mere speculative men."‡ We are told, that "Dublin is rising on us, a fact which should call forth, not our jealousy, but our emulation."‖ But how, I may ask, can we exert ourselves without the requisite means? We may as well send an army into the field without ammunition, as at Buenos Ayres, or still more recently on the coast of Africa against the Ashantees!

The alterations which I would humbly propose would be the following:—*First*, let the candidate be examined on chemistry, either in Latin or English, it matters little which, in the professor of chemistry's class-room, making the candidate perform certain experiments, and give the theories of their chemical action. *Secondly*, let him be exa-

* Hints respecting the improvement of the literary and scientific education of candidates for the degree of doctor of medicine in the University of Edinburgh.

† In confirmation of this melancholy truth, see Comparative View of the Schools of Dublin and Edinburgh, Westminster Review for July 1824, page 85.

‡ Answer to Dr. Gregory's Memorial. By John Bell.

‖ Blackwood's Magazine for August 1824.

mined on botany, in the botanical garden, particularly in medical botany. *Thirdly*, let him be examined on anatomy in the professor of anatomy's theatre, where he shall dissect a part of the human body, as the brain, the contents of the thorax, or the abdomen, displaying at the same time the nerves and blood-vessels of these organs and cavities. *Fourthly*, let him be examined as to his knowledge of materia medica and pharmacy, in the laboratory of the professor of these departments; let him distinguish the different medicines presented him, state their doses, and lastly compound some of them. *Fifthly*, let him enter the wards of the hospital, name the diseases of some of the patients, and prescribe for them.

Were such tests of a young gentleman's abilities published to the world, I feel confident that the reputation of an Edinburgh degree would attain a still greater celebrity in the estimation of the public, than it has hitherto acquired. There is nothing novel or chimerical in the proposed amendments, which have in fact been adopted and put in practice for some years past in Copenhagen, in conferring a surgical diploma. A mode of examination, I may remark, truly worthy of imitation by all medical and surgical colleges, particularly the Col-

lege of Surgeons of this place, where the school of surgery is so sunk in the opinion of the public.* "The system of medicine and surgery, which is established in any country, has a greater influence over the lives of its inhabitants, than the epidemic diseases produced by its climate, or the decisions of its government concerning peace and war. The devastations of the yellow fever will bear no comparison with the ravages committed by the Brunonian system; and the slaughter of the field of Waterloo counts not of victims, a tithe of the number of which the Cullenian doctrine of debility can justly boast."†

* Home on Strictures, Crowther on White Swelling, Gregory's Memorial, 1800, John Bell's Letters on the Education of a Surgeon, 1810, and Medico-Chirurgical Review.

† Westminster Review for July 1824, page 79.

CONTENTS.

Page

Muscles of the Lower Extremity.

Muscles of the Thigh.

Gluteus Maximus Muscle, (Pls. XV. and XVI. of Part VI., and Pl. XVII. of Part III., letters F, f,) - - 139
Gluteus Medius Muscle, (Pl. XVII. of Part III., and Pl. XVI. of Part VI., letter I,) - - - 141
Pyriformis Muscle, (Pl. XVI. of Part VI., and Pl. XVII. of Part III., letter A,) - - - - 142
Gluteus Minimus Muscle, (Pl. XVI. of Part VI., letter c,) 143
Obturator Internus Muscle, (Pls. XVI. and XVII. of Part VI., and Pl. XVII. of Part III., letter X,) - 144
Gemellus Superior Muscle, (Pls. XVI. and XVII. fig. 1 of Part VI., letter x,) - - - - 145
Gemellus Inferior Muscle, (Pls. XVI. and XVII. fig. 1 of Part VI., letter *x*,) - - - - 146
Quadratus Femoris Muscle, (Pl. XVII. of Part III., and Plate XVI. of Part VI., letters K,) - - - 146
Obturator Externus Muscle, (Pl. XIV. of Part V., and Plate XVI. of Part VI., letters D,) - - - 147
Semi-tendinosus Muscle, (Pls. XVII. and XX. of Part III., and Plates XVI. and XX. of Part VI., letter M,) 148
Biceps Flexor Cruris Muscle, (Pl. XVI. of Part VI., and Pl. XVII. of Part III., letters L, l, *l*,) - - 149
Semi-membranosus Muscle, (Pls. XVII. XVI. and XX. of Part III., Plate XIV. of Part V., and Plate XX. of Part VI., letter N,) - - - 150

Muscles of the Leg.

Gastrocnemius Muscle, (Pls. XIX. XX. and XVII. of Part III., and Pl. XX. fig. 1 of Part VI., letters R, r, *r*,) 171
Plantaris Muscle, (Pl. XX. fig. 1 of Part VI., and Plate XIX. of Part III., letters U, u,) - - 173
Popliteus Muscle, (Plate XX. of Part III., and Plates XX. XXI. and XXII. of Part VI., letter V,) - 174

Page

Flexor Longus Digitorum Pedis Muscle, (Plate XXI. fig. 1, letters O, *o*,) - - - - - 178
Tibialis Posticus Muscle, (Pl. XXII. fig. 1, letter a,) - 181
Peroneus Longus Muscle, (Pl. XVIII. of Part III., and Pls. XX. XXIII. and XXIV. figs. 1 of Part VI.) 186
Peroneus Brevis Muscle, (Pls. XX. XXI. XXII. XXIII. and XXIV. figs. 1 of Part VI., letter I,) - 188
Tibialis Anticus Muscle, (Plate XVIII. of Part III., letter A,) 192
Extensor Longus Digitorum Pedis Muscle, (Plate XVIII. of Part III., letter B,) - - - - 189

Muscles of the Foot.

Flexor Brevis Digitorum Pedis Muscle, (Plate XX. of Part III., and Plate XXI. fig. 1 of Part VI.,) - 176
Musculus Accessorius ad Flexorem Longum Digitorum Pedis, (Pl. XX. fig. 1, letter G,) - - - 179
Lumbricales Pedis Muscles, (Pl. XXI. fig. 1, letters k,) 180
Transversalis Pedis Muscle, (Plate XXII. fig. 1, letter L,) 182
Extensor Brevis Digitorum Pedis Muscle, (Plate XVIII. of Part III., letter E,) - - - - 191

Muscles of the Great Toe.

Flexor Longus Pollicis Pedis Muscle, (Pl. XXI. fig. 1 of Part VI., letters A, *a*,) - - - - 181
Flexor Brevis Pollicis Pedis Muscle, (Pl. XXI. fig. 1 of Part VI., and Plate XX. of Part III., letter X,) 183
Adductor Pollicis Pedis Muscle, (Plate XXII. of Part VI., letter *q*,) - - - - - 184
Abductor Pollicis Pedis Muscle, (Pl. XX. of Part III., letter B,) - - - - - 177
Extensor Proprius Pollicis Pedis Muscle, (Plate XVIII. of Part III., letter C,) - - - - 191

Muscles of the Little Toe.

Flexor Brevis Digiti Minimi Pedis Muscle, (Pl. XXI. fig. 1 of Part VI., letter N,) - - - - 185
Abductor Minimi Digiti Pedis Muscle, (Pl. XXI. fig. 1 of Part VI., letter F,) - - - - 184

Small Muscles of the Toes.

Interossei Digitorum Interni Pedis Muscles, (Plate XXIII. fig. 1 of Part VI., letters M, P, Q, T, *w*, *g*, *t*,) - 195
Abductor Digiti Medii Pedis Muscle, (Pl. XXII. fig. 1 of Part VI., letter M,) - - - - 195

Page

Abductor Tertii Digiti Pedis Muscle, (Plate XXII. fig. 1 of Part VI., letter p,) - - - 196
Abductor Digiti Minimi Pedis Muscle, (Pl. XXII. fig. 1 of Part VI., letter q,) - - - 196
Interossei Digitorum Externi Pedis Muscles, (Pl. XXIV. fig. 1 of Part VI., letters g, h, k, l,) - - 193
Abductor Indicis Pedis Muscle, (Plate XXIV. fig. 1 of Part VI., letter o,) - - - - 193
Adductor Indicis Pedis Muscle, (Plate XXIV. fig. 1 of Part VI., letter n,) - - - - 194
Adductor Medii Digiti Pedis Muscle, (Pl. XXIV. fig. 1 of Part VI., letter k,) - - - - 194
Adductor Tertii Digiti Pedis Muscle, (Pl. XXIV. fig. 1 of Part VI., letter l,) - - - - 194

Ligaments of the Trunk.

Capsular Ligament of Articular Processes of Vertebræ, (Pl. XVIII. fig. 2 of Part VI., dig. 2,) - - 161
Common Anterior Ligament of Vertebræ, (Pl. XVIII. fig. 3 of Part VI., letter *a*,) - - - - 161
Crucial Ligaments of Vertebræ, (Pl. XVIII. fig. 1 of Part VI., letter b,) - - - - - 161
Capsular Ligament of Head of Rib, (Pl. XVIII. fig. 3 of Part VI., letter c,) - - - - - 161
Obturator Ligament, (Pl. XVII. fig. 2 of Part VI., letter u,) - - - - - 156
Longer Sacro-Ischiadic Ligament, (Pl. XVII. fig. 1, and Pl. XVIII. figs. 1 and 2 of Part VI., letter h,) - 158
Shorter Sacro-Ischiadic Ligament, (Pl. XVII. fig. 1, and Pl. XVIII. figs. 1 and 2 of Part VI., letter h,) - 159
Ligamentous Expanse of Os Coccygis, (Pl. XVIII. fig. 2 of Part VI., letter a,) - - - - 159
Lacertus Ligamentosus of Pelvis, (Pl. XVIII. fig. 1 of Part VI., letter q,) - - - - 160
Annular Ligament of Symphysis Pubis, (Pl. XVIII. fig. 1 of Part VI.,) - - - - - 160
Ilio-Sacral Ligaments, (Pl. XVIII. fig. 2 of Part VI., letter z,) - - - - - 160
Transverse Ligaments of Pelvis, (Pl. XVIII. fig. 2 of Part VI., letter k,) - - - - - 160
Ligamenta Vaga of Pelvis, (Pl. XVIII. figs. 1 and 2 of Part VI., letters *i*,) - - - - 161

Page

Ligaments, &c. of the Lower Extremity.

Capsular Ligament of Hip-Joint, (Pl. XIV. of Part V., and Plate XVII. of Part VI., letters A, *a*,) - - 151
Synovial Gland, (Pl. XVII. fig. 2 of Part VI., letter R,) - 152
Ligamentum Teres, (Pl. XVII. fig. 2 of Part VI., letter B,) 153

Ligaments, &c. of the Knee-Joint.

Tendinous Expanse of Fascia Lata and Vasti Muscles, (Pl. XIX. fig. 1 of Part VI., letters *l*, *o*,) - 162
Patellar Ligament, (Pl. XIX. fig. 1 of Part VI., letter *y*,) 162
Bursa Mucosa of Patellar Ligament, (Pl. XIX. fig. 1 of Part VI., letter *p*,) - - - - 162
Popliteal Ligament, (Pls. XX. XXI. XXII. and XXIII. figs. 1 of Part VI., digits 10,) - - - 163
Tibial Lateral Ligament, (Pls. XX. XXI. XXII. and XXIII. figs. 1 of Part VI., digit 2,) - - - 163
Fibular Lateral Ligament, (Pl. XIX. figs. 1 and 2, and Pls. XXI. XXII. and XXIII. figs. 1 of Part VI., digit 3,) 163
Capsular Ligament, (Pl. XIX. fig. 2, and Pl. XX. figs. 2 and 3 of Part VI., digits 4,) - - - 164
Bursa Mucosa, beneath Insertions of Crureus and Rectus Muscles, (Pl. XIX. fig. 2 of Part VI., digit 1,) - 164
Mucous Ligament, (Pl. XIX. fig. 2 of Part VI., digit 8,) 165
Synovial Gland, (Pl. XIX. fig. 2 of Plate VI., digit 7,) - 165
Alar Ligaments, (Pl. XIX. fig. 2 of Part VI., digits 10,) 165
Crucial Ligaments, (Pl. XX. figs. 2 and 3 of Part VI., digits 11, 12,) - - - - - 165
Semilunar Cartilages, (Pl. XX. fig. 2 of Part VI., digits 13, 14,) - - - - 166

Ligaments connecting the Tibia and Fibula together, 196
Intertransverse Ligaments of Head of Fibula, (Pl. XXIII. fig. 1 of Part VI., digit 4,) - - - 198
Capsular Ligament of Head of Fibula, (Pl. XXIII. fig. 1 of Part VI.,) - - - - - 198
Interosseous Ligament, (Pls. XXIII. XXIV. XXII. XXI. figs. 1 of Part VI., H,) - - - - 196
Intertransverse Ligaments of Distal Extremities of Tibia and Fibula, (Pl. XXIV. figs. 1, 2, and 3, digit 7,) - 198

Ligaments, &c. of the Ankle-Joint, - - 199
Capsular Ligament, (Pl. XXIV. figs. 1, 2, and 3, and Pl. XXI. fig. 2 of Part VI., digits 30,) - - 199
Deltoid Ligament, (Pl. XXII. fig. 2, and Pl. XXIV. fig. 1 of Part VI., digit 11,) - - - 199

Page

Fibular Lateral Ligament, (Pl. XXIV. figs. 1, 2, and 3 of Part VI., digits 31, 32, and 14,) - - 199
Fibular Anterior Portion, (Pl. XXIV. fig. 1 of Part VI., digit 31,) - - - - - 199
Fibular Middle Portion, (Pl. XXIV. figs. 1, 2, and 3 of Part VI., digit 32,) - - - - 200
Fibular Posterior Portion, (Pl. XXIV. fig. 3 of Part VI., digit 14,) - - - - - 200
Synovial Tissue, (Pl. XXIV. fig. 3 of Part VI., digit 10,) - 199

Ligaments of the Foot.

Tarsal Ligaments, (Pl. XXIV. fig. 1, letters *z*, and Pls. XXII. and XXIII., letters *w*, *y*, of Part VI.,) - 201
Patellar Transverse Ligaments, (Pl. XXIV. fig. 1, and Pl. XXI. fig. 3 of Part VI., letters *z*,) - - 202
Intertransverse Ligament, (Pl. XXI. fig. 2 of Part VI., *z*,) 202
Plantar Ligaments, (Pls. XXII. and XXIII. figs. 1 and 2 of Part VI., letters *w*, *y*,) - - - 202

Surgical Observations.

Diseases of Bursa Mucosa, beneath Gluteus Maximus Muscle, - - - - - 140
Operation of Amputation of the Thigh, - - 150
Luxation of the Hip-Joint, - - - - 153
Morbus Coxarius, - - - - - 158
Diseases of Bursa Mucosa, beneath Patellar Ligament, - 162
Fracture of the Patella, - - - - 166
Laceration of the Tendons of the Muscles inserted in Patella, 167
Luxation of the Patella, - - - - 167
Luxation of the Knee-Joint, - - - - 167
Displacement of the Interarticular Cartilages in Knee-Joint, 167
Wounds of the Knee-Joint, - - - - 168
Cartilaginous Bodies in the Knee-Joint, - - 168
Inflammation of the Knee-Joint, - - - 168
Dropsy of the Knee-Joint, - - - - 169
Suppuration of the Knee-Joint, - - - 169
White Swelling of the Knee-Joint, - - - 169
Excision of the Knee-Joint, - - - - 170
Ruptured Tendo Achillis, - - - - 173
Wounds of the Fascia Plantaris, - - - 175
Fracture of the Tibia and Fibula, - - - 187
Sprains of the Muscles of the Leg, - - - 189
Operation of Amputation of the Leg, - - - 197
Luxation of Head of the Fibula, - - - 198
Luxation of the Ankle-Joint, - - - 200

THE

MUSCLES

OF THE

LOWER EXTREMITY.

HAVING examined the muscles on the anterior or rotular aspect of the limb, we come now to those on the posterior or popliteal aspect.

The thick adipose integuments superficial to the gluteus maximus muscle,* which first presents itself in this dissection, and is marked with the letters F, in Plates XV. and XVI. of this Part, and in Plate XVII. of Part III., and also in Plate XIV. of Part III., with the letter Y, should be removed, by making first an oblique incision in the centre, parallel† to the fibres of the muscle, until they appear; then dissecting from the origin

* Syn. Primus femur moventium: Primus musculus femur movens: Primus omnium maximus, sui lateris clunem efformans: Maximus et extimus gloutius: Extendentium primus, glutæus major: Glutæus major: Glutæus maximus: Gluteus magnus: Glutæus magnus: Le grand fessier: Sacro-fémoral: Ilii-sacro-fémoral.

† This line of incision may be calculated by dividing the space between the superior posterior spinous process of the os ilium, and the extremity of the os coccygis into two equal parts, and from this central point drawing a line obliquely over the most prominent part of the trochanter major. The same line of incision is applicable to the securing of the gluteal artery when wounded, as described in Part III., page 106.

to the insertion, or vicê versâ, carefully avoiding both the tendinous slips of the origin, and the strong tendinous fibres of the insertion incorporated with the fascia lata k. The muscle will then be found to arise by tendinous and muscular slips, from a small surface of the crista of the os ilium,* near the posterior superior spinous process *f*, from this process itself, from the dorsum of the os sacrum, particularly its spinous processes, and the dorsum of the os coccygis, and also from the long or outer sacro-ischiadic ligament H. The fibres descend obliquely fibulad or outwards, over the trochanter major e of the os femoris, where the superior or anterior or iliac are incorporated with the fascia lata k, from the origin of the gluteus medius I, downwards to what is termed the fleshy insertion of the muscle, which runs into the outer or fibular division of the linea aspera of the os femoris, while the inferior or sacral or coccygeal fibres are loose and free. The precise origin and insertion are best seen in Plate XVI., the latter being marked f. The tendinous expanse of the gluteus medius I is, strictly speaking, the fascia lata, which also covers the gluteus maximus; on the latter, however, it is more delicate, and may be considered the cellular envelope of the muscle. This gluteus illustrates the structure of a muscle better than any other. The larger insertion of this muscle is into the fascia lata, which also covers its fleshy insertion. As the muscle glides over the trochanter major e, there is a large bursa mucosa, which is delineated in Plate XVI., marked *f*.†

* See Part I. Plate VIII. *Fig.* 2.

† This bursa is liable to be affected with a superabundant secretion of mucus, with matter forming a chronic abscess, with cartilaginous substances, and with hydatids. In either of the two former cases, a small opening and bandage will generally cure the disease; in the two latter the bursa requires a freer opening, to extract or discharge these substances.

The function of this muscle is to extend and abduct the os femoris, and to rotate the toes fibulad or outwards; the latter of which actions is greatly assisted by the fascia lata being attached to the linea aspera of the os femoris, to the patella, the fibula, and the tibia. This muscle is also through the same fascia, either a flexor, or extensor of the tibia. When the os femoris is made the fixed point, the muscle inflects the trunk fibulad, and rotates it by the dorsal aspect.*

To expose the whole of the gluteus medius muscle,† marked with the letters I in Plate XVII. of Part III., and Plate XVI. of Part VI., the gluteus maximus F is to be cut across beginning at its coccygeal margin, leaving enough of the origin to examine the muscle afterwards, and keeping the fibres strongly on the stretch to avoid injuring the long sacro-ischiadic ligament H, the pyriformis muscle A, and the medius itself, I. The dissector must keep close to the central or internal surface of the maximus as he proceeds, as there is a considerable quantity of cellular substance between it and the medius.

The gluteus medius, I, now appears, situated on the dorsum of the ilium, and covered by a strong tendinous aponeurosis, the continuation of the fascia lata K, excepting where it was overlapped by the maximus; deriving its origin from the dorsum of the os ilium, between the anterior superior spinous process, and the greater sacro-ischia-

* The gluteus maximus relates to the securing of the gluteal and ischiadic arteries, as detailed in Part III., pages 106 and 107; is concerned in morbus coxarius, in dislocation of the hip-joint, in fracture of the neck and shaft of the os femoris, and in amputation of the hip-joint, as described in Part III., page 111.

† Syn. Secundus femur moventium. Secundus femoris musculus Secundus et medius glutius. Extendentium secundus, glutæus medius Glutæus medius Le moyen fessier Grand ilio-trochantérien Ilio-trochantérien.

dic notch; and descending with converging fibres, to be inserted in the tip of the trochanter major t.

The surface of the bone whence this muscle arises is clearly defined in Part I., Plate VIII. *Fig.* 2., marked with the letters *b*. The anterior or patellar fibres are so intimately connected with the muscular fibres of the tensor vaginæ femoris K, that they can with difficulty be separated; and the posterior or sacral or popliteal fibres, are so closely attached to the pyriformis muscle A, that the latter appears an appendage of the former: the tendons are often inseparable. The insertion is distinctly seen in *Fig.* 1 of Plate XVII., marked i.

The function of the gluteus medius is chiefly to abduct the limb, for it may either bend or extend the os femoris, according as the patellar or sacral fibres are called into action. For the same reason the patellar fibres are rotators tibiad, while the sacral are rotators fibulad. When the os femoris becomes the fixed point, this muscle inflects the trunk fibulad, and rotates it either by the dorsal or sternal aspect.*

Instead of proceeding to the gluteus minimus, I shall first describe the pyriformis muscle, as it appears to be an appendage of the gluteus medius, and requires removal before the gluteus minimus can be properly investigated.

The pyriformis muscle† A, in Plate XVI. of this Part, and in Plate XVII. of Part III., is situated on the dor-

* The gluteus medius relates to the securing of the gluteal artery, and is concerned in morbus coxarius, in luxation of the hip-joint, in fracture of the neck and shaft of the os femoris, and in amputation at the hip-joint, as described in Part III., page 111.

† Syn. Quartus femur moventium: Quartus femoris musculus: Primus et superior quadrigeminus, iliacus externus: Circumagentium primus, iliacus externus, pyriformis · Pyriformis, seu iliacus externus: Le pyriforme ou pyramidal: Sacro-trochantérien: Sacro-ili-trochantérien.

sum of the pelvis, running parallel with the sacral fibres of the gluteus medius I; it derives its origin within the pelvis from the body of the os sacrum, emerges at the greater sacro-ischiadic notch, where it derives additional origin from the os ilium, descends along the sacral margin of the gluteus medius I, and forms a strong round tendon, which is inserted in the rut behind the trochanter major e of the os femoris.

The origin of the pyriformis from the os sacrum within the pelvis, is from the second, third, and fourth portions, close to the foramina which give exit to the sacral nerves forming the great sacro-ischiadic, with which the fibres of the muscle are more or less blended, frequently even to their emergence at the notch, as is exemplified in Plate XVI. Its emergence at the greater sacro-ischiadic notch is also represented in Plate XVII. *Fig.* 1 of this Part. The muscle is always closely connected with the gluteus medius, particularly the tendon. The point of insertion is clearly defined in Part I., Plate VIII. *Figs.* 3 and 4, letter *i*.

The function of the pyriformis is to extend and abduct the os femoris, and to rotate the toes fibulad or outwards. When the os femoris is made the fixed point, it inflects the trunk fibulad, and rotates the trunk by the dorsal aspect.*

The gluteus minimus muscle† c, in Plate XVI., is brought into view, by dividing the pyriformis A, and the

* The pyriformis muscle is concerned in luxation of the hip-joint, in morbus coxarius, in fracture of the neck of the os femoris, and in amputation at the hip-joint, as described in Part III., page 111.

† Syn. Tertius femur moventium Tertius femoris musculus: Tertius et internus glutæus: Extendentium tertius, glutæus minor Glutæus minor. Gluteus minimus. Gluteus minor. Le petit fessier. Petit ilio-trochantérien: Ilio-ischio-trochantérien.

gluteus medius I, performing the division of the latter by beginning from the pyriformis muscle, and ending at the tensor vaginæ femoris muscle K:* between the gluteus medius and minimus there is very little cellular substance; the clear shining fibres of the latter with a conspicuous branch *c* of the gluteal artery are the only guides. The gluteus minimus now appears situated on the dorsum of the os ilium, deriving its origin between the inferior anterior spinous process, and the greater sacro-ischiadic notch, and descending with elegant converging fleshy fibres, which almost immediately become tendinous, and are inserted in the anterior or patellar aspect of the trochanter major e. This muscle adheres to the bone and capsular ligament of the hip-joint throughout its course, or from its origin to its insertion. The precise origin of this muscle is delineated in Plate XVII., *Figs.* 1 and 2, marked *c*; and the insertion in *Fig.* 1, marked c. These points of bone are also represented in Part I., Plate VIII., *Figs.* 2 and 3; the origin in *Fig.* 2 being marked with the letters *c*, and the insertion in *Fig.* 2 marked *c*.

The function of the gluteus minimus is chiefly to abduct the limb: it is, however, also a flexor and a rotator tibiad. When the os femoris becomes fixed, it inflects the trunk fibulad, and rotates it by the sternal aspect.†

The obturator internus muscle‡ X, in Plates XVI. and

* The K indicating the tensor vaginæ femoris, is on the outer or fibular aspect of the limb, this being the left extremity, and the muscle is represented on the stretch; while the quadratus femoris, marked also by K, is divided across.

† The gluteus minimus is concerned in luxation of the hip-joint, in morbus coxarius, in fracture of the neck of the os femoris, and in amputation at the hip-joint, as described in Part III., page 111.

‡ Syn. Decimus femur moventium: Decimus femoris musculus: Circumagentium tertius, obturator internus: Marsupialis seu bursalis: Marsupialis seu obturator internus: L'obturator interne: Sous-pubio-trochantérien interne: Intra-pelvio-trochantérien.

XVII. *Fig.* 1 of this Part, and in Plate XVII. of Part III., is situated partly within and partly without the pelvis. Within the pelvis, the muscle is covered by the levator ani muscle s, and on the dorsal or outer aspect of the pelvis, the muscle lies immediately distad to the pyriformis muscle A.

The obturator internus derives its origin from the internal or pelvic surface of the obturator or thyroid ligament, and the margin of the bones forming the obturator foramen, descends with converging fibres, and emerges from the pelvis at the less sacro-ischiadic notch, where it is joined by the two gemelli muscles x, *x*, which proceed obliquely across, forming one tendon inserted in the rut behind the trochanter major e of the os femoris. Where the muscle glides round the os ischium, between the spine and tuberosity, there is a bursa mucosa, marked 1, in *Fig.* 1 of Plate XVII. In this figure of the same Plate, the tendinous insertion of the muscle is clearly displayed. The gemelli muscles are appendages or integral portions of the obturator internus. The gemellus superior* is merely the trifling fasciculus of fibres marked x, which arise from the spine of the os ischium, and accompany the muscular fibres of the obturator internus, until they become tendinous, when they unite, and form one tendon. At first a difficulty exists in the separation of the gemelli from the obturator, and the only legitimate way to distinguish them, is to remove the obturator from its origin within the pelvis, and to pull it through the notch, when the fibres constituting

* Syn. of Gemellus superior et inferior: Carneæ portiones, decimo femur moventium musculo attenæ: Marsupium carneum Secundus et tertius quadrigeminus: Carneum marsupium: Marsupium. Gemini Les petits jumeaux Le jumeaux · Muscle capsulaire de la capsule du tendon de l'obturateur interne Ischio-trochantérien. Ischio-spini-trochantérien.

the gemelli remain. The precise origin of this gemellus is seen in *Fig.* 1 of Plate XVII. The superior gemellus is occasionally deficient.

The gemellus inferior muscle,* marked *x*, in Plate XVI., derives its origin from the tuberosity Z of the os ischium, and like the superior, accompanies the muscular fibres of the obturator internus, until they become tendinous, when they unite, and along with the superior form one tendon, inserted in the rut behind the trochanter major e. The precise origin is distinctly seen in *Fig.* 1 of Plate XVII.

The functions of the obturator internus and the gemelli are the same, only the obturator has more power than the gemelli. They extend and abduct the os femoris, and rotate it fibulad; and when the os femoris becomes the fixed point, they inflect the trunk fibulad, and rotate it by the dorsal aspect.†

The quadratus femoris muscle,‡ letters κ, in Plate XVII. of Part III., and in Plate XVI. of this Part,§ situated between the os ischium and the trochanter major of the os femoris, derives its origin from the obtuse ridge of the os ischium, between the tuberosity and the obturator foramen, and runs transversely to be inserted in the

* The synonymes of the gemellus superior answer also for this. See page 145.

† The obturator internus and gemelli are concerned in luxation of the hip-joint, in morbus coxarius, in fracture of the neck of the os femoris, and in amputation at the hip-joint, as described in Part III., page 111.

‡ Syn. An est pars quinti femur moventium : Pars octavi femoris musculi : Est undecimus movens femur : Undecimus : Quartus quadrigeminus quadratus : Circumagentium quartus : Quadratus femori : Le carré : Carré crural : Ischio-sous-trochantérien : Tuber-ischio-trochantérien.

§ The quadratus femoris indicated by the letters κ, in Plate XVI. of this Part, is cut across, so that it is easily distinguished from the tensor vaginæ femoris, inadvertently marked with the same letter, the latter muscle being entire and on the stretch, and having only one letter placed on it, while the quadratus has four.

ridge extending between the trochanter major and minor. This muscle throughout is fleshy; its origin is distinctly seen in Plate XVII. *Fig.* 2, and its insertion in Plate XVI.

The function of the quadratus femoris is to extend and adduct the os femoris, and also to rotate the toes fibulad. When the os femoris becomes the fixed point, it inflects the trunk tibiad, and turns it by the dorsal aspect.*

The obturator externus muscle,† letters D, in Plate XIV. of Part V., and Plate XVI. of Part VI., situated beneath the pyramidalis muscle P, and the three heads g, g, G, of the triceps muscle, derives its origin from the exterior surface of the obturator ligament, and the margins of the bones forming the obturator foramen, and runs with converging fibres round, or poplitead to the cervix of the os femoris, to be inserted by a strong tendon in the rut behind the trochanter major e of the os femoris. In Plate XIV. of Part V., the radiated origin is distinctly seen; the pyramidalis P, the gracilis Q, and the three heads g, g, G, of the triceps, being removed close to their origins. The obturator artery *d*, the vein d, and the twigs of the nerve 21, are observed piercing the fibres of the muscle. The muscle is perceived to adhere to the capsular ligament A, in its course round the neck of the os femoris. In Plate XVI. of this Part, the muscle was hid by the quadratus femoris K, and hence the latter is cut across. In *Fig.* 2 of Plate XVII., the origin from the ossa pubis

* The quadratus femoris muscle is concerned in luxation of the hip-joint, in morbus coxarius, in fracture of the neck of the os femoris, and in amputation at the hip-joint, as detailed in Part III., page 111.

† Syn. Nonus femur moventium Nonus femoris musculus Duodecimus · Externus obturator Circumagentium secundus, externus obturator: L'obturateur externe Sous-pubio-trochanterien externe Extra-pelvio-pubi-trochanterien.

et ischii, where they form the obturator foramen, is represented; that from the ligament U having been removed to exhibit the latter. The function of the obturator externus muscle is to adduct the os femoris, and to rotate the toes fibulad. When the os femoris becomes the fixed point, it inflects the trunk tibiad, and rotates it by the dorsal aspect.*

A the hamstring muscles influence the healthy and diseased functions of the hip-joint, I shall describe them before proceeding to this articulation.

The semi-tendinosus muscle† M, in Plates XVII. and XX. of Part III., and in Plates XVI. and XX. of Part VI., situated on the popliteal aspect of the thigh, immediately beneath the fascia lata k, arises by a broad origin, in conjunction with the long head of the biceps muscle L, from the tuberosity Z of the os ischium, descends connected with the biceps muscle, nearly one-half of the thigh, where it separates, and proceeds along the tibial margin of the poples, forming a long tendon, which is inserted along with the sartorius E, and the gracilis Q, in the head of the tibia, distad and poplitead to its tubercle, being covered by the tendinous expanse of the former, and situated distad to the latter. The connexion with the biceps, both at the origin and downwards in the thigh, is very strong, and requires to be cautiously separated from the poples upwards. These two muscles conceal the semi-membranosus. The insertion is partly surrounded by a bursa mucosa common to this muscle, the

* The obturator externus is concerned in luxation of the hip-joint, in morbus coxarius, in fracture of the neck of the os femoris, and in amputation at the hip-joint, as detailed in Part III., page 111.

† Syn. Tertius tibiam moventium: Tertius tibiæ musculus: Semi-nervosus: Flectentium tibiam tertius, semi-nervosus: Semi-nervosus, seu semi-tendinosus: Le demi-nerveux: Le demi-tendineux: Ischio-prêtibial: Ischio-crêti-tibial.

sartorius and the semi-membranosus muscles, as represented in Plate XX. of this Part; the bursa being marked *e*.

The function of this muscle is to extend and adduct the os femoris, to bend the tibia on the os femoris or the knee-joint, and to rotate the toes tibiad, if the leg be extended.*

On the popliteal aspect of the thigh, immediately beneath or centrad to the fascia lata k, and parallel with the semi-tendinosus muscle, the biceps flexor cruris,† letters L, l, *l*, Plate XVII. of Part III., and Plate XVI. of Part VI., is found. The long head L of this muscle derives its origin from the tuber ischii Z, in conjunction with the semi-tendinosus M, descends nearly one-half of the thigh, where it separates from the latter, proceeds to the fibular margin of the poples, and is joined by its shorter head l, which arises from the distal half of the linea aspera of the os femoris; and thus united, both continue to descend on the fibular aspect of the poples, and are inserted by one tendon *l* in the head of the fibula.

The function of the biceps muscle is to extend and adduct the os femoris, to bend the knee-joint, and to rotate the toes fibulad, if the leg be extended.‡

* The semi-tendinosus muscle relates to the securing of the popliteal artery, as described in Part III., page 114; to amputation at the hip-joint, as detailed in Part III., page 111; to dislocation of the hip-joint, to morbus coxarius, to fracture of the neck and body of the os femoris, and to amputation of the thigh. It is also concerned in amputation of the leg, in luxation and other injuries and diseases of the knee-joint.

† Syn. Quartus tibiam moventium · Quintus tibiæ musculus Biceps: Flexor tibiam quintus, biceps Biceps cruris · Le biceps; Biceps femoris Biceps crural: Ischio-fémoral-péronier.

‡ The biceps muscle relates to the securing of the popliteal artery, as detailed in Part III., page 114; to amputation at the hip-joint, as described in Part III., page 111; to luxation of the hip-joint, to morbus coxarius, to fracture of the neck and

The semi-membranosus muscle* x, Plates XVII. XVI. and XX. of Part III., Plate XIV. of Part V., and in Plate XX. of Part VI., situated on the popliteal aspect of the thigh, beneath or centrad to the biceps L, and semi-tendinosus M muscles, derives its origin from the tuberosity Z of the os ischium, and descends along the tibial margin of the poples, forming a strong tendon, which is inserted in a tubercle, on the popliteal aspect of the head of the tibia. The origin is chiefly tendinous, the muscle swelling to a great breadth in its middle, and forming a penniform appearance. The insertion is defined in Plate XX. of this Part. The function is to extend and adduct the os femoris, and to bend the knee-joint.†

shaft of the os femoris, and to amputation of the thigh. It is also concerned in amputation of the leg, in luxation and other injuries and diseases of the knee-joint.

* Syn. Quintus tibiam moventium: Quartus tibiæ musculus: Flectentium tibiam quartus, semi-membraneus: Le demi-membraneux: Demi-aponévrotique: Ischio-popliti-tibial.

† The semi-membranosus muscle relates to the securing of the popliteal artery, as described in Part III. page 114; to amputation at the hip-joint, as detailed in the same Part, page 111; to luxation at the hip-joint, to morbus coxarius, to fracture of the neck and body of the os femoris, and to amputation of the thigh. It is also concerned in amputation of the leg, in luxation and other injuries and diseases of the knee-joint.

The various muscles of the thigh should be considered in their relation to fracture of the shaft of the os femoris, and to amputation of the thigh; with respect to the former, the reader is referred to Part I. page 119; and with regard to the latter, he must remember that many of the muscles around the thigh are free and loose; and therefore, when divided in the living state, they retract from the face of the stump, and cannot be retained by the most dexterous bandaging, so as to cover the cut end of the bone. Consequently the muscles which we have to take into more immediate consideration, are the crureus, the two vasti, and the heads of the triceps, with the short head of the biceps, according to the part of the limb to be removed. As the patient will have to lie on his back after the operation, the line of cicatrix should run from the patellar to the popliteal aspect. The patient being placed on a table with the leg hanging over, and supported by an assistant, and the roller or pad,

When the several muscles around the hip-joint, and those of the thigh have been examined, the ligaments of the preceding joint should be investigated. These are the capsular and the teres, which are represented in Plate XIV. of Part V., and in Plate XVII. of Part VI.; the former, or capsular, is marked A, and the latter, or teres, B.

The capsular ligament A,* situated around the articula-

with the screw of the tourniquet placed over the artery, and sufficiently tight to compress the circulation; and the skin being retracted by an assistant, two semi-elliptical incisions are to be made, with a large scalpel, through the skin and contiguous muscles, from the patellar to the popliteal aspect, as deep as possible, with their convexities large, and pointing distad, and their extremes meeting patellad and poplitead. A repetition of each incision, boldly made, enables the operator to reach the bone, which is to be cleaned of the adhering muscular fibre the flaps are then retracted, and the bone sawn by long gentle sweeps of the saw. The arteries are next to be secured, which, generally, are only the superficial femoral, and the continuation of the profunda femoris. See Part III. Plate XVI. Both ends of the ligatures should be cut off, the flaps brought in apposition, and retained by adhesive plaister, dry lint and the malta cross afterwards applied; and the roller which should encircle the loins, and be put round before the operation, having been brought regularly down to the face of the stump, is then to be carried for a few turns upwards. I have said, that generally the superficial femoral artery, and continuous branch or trunk of the deep femoral, are all that require to be secured; for it appears to me, that we are too solicitous about small arteries where we can employ compression. I have trusted to compression alone, after removal of a mamma of great magnitude; and where two of the arteries, the one the long mammary from the axillary, the other one of the branches of the internal mammary, were as large as the radial, and no hemorrhage whatever ensued. We have more to apprehend from venous than arterial bleeding, if proper compression cannot be made; the arteries shrink, while the veins remain flaccid. I have been particular in the recommendation of applying the roller with the screw of the tourniquet over the course of the artery, from having lately witnessed some of our operators apply the screw apart from the roller, the latter on the course of the artery, but the former, or screw, on the outside of the limb; the consequence of which was, when the artery was divided, the blood spouted with impetuosity. I have been in the habit of teaching and practising this line of incision for these some years past, and can declare that an excellent stump is thus formed.

* Syn. Membrana capsularis femoris. Capsule fibreuse de l'articulation coxo-fémorale.

tion of the thigh bone with the pelvis, arises from the os innominatum round the brim of the acetabulum, by strong ligamentous fibres, which encircling the head *b*, and cervix *d*, of the os femoris, is inserted in the root of the cervix at the trochanters, then glides with more or less scattered fibres upwards to the margin of the head *b*, where it terminates. In Plate XVII. *Fig.* 2, the capsular ligament is cut across by a circular incision, nearly at equal distances, between its attachment to the os innominatum, and its first attachment to the root of the cervix of the os femoris; the letters A indicate the former, the letter a the latter. The letters *a* indicate the reflection of the ligament, along the cervix D, to the margin of the head; the letter D being placed merely to designate the cervix. The fibres of the ligament are generally strongest opposite the inferior anterior spinous process, as represented in *Fig.* 1, Plate XVII. letter a. The interior surface of this ligament illustrates the synovial membrane in a satisfactory manner. The acetabulum is considerably deepened by a brim of cartilage, marked 1, in *Fig.* 2, which is better understood by comparing this Plate with Plates III. and VIII. of Part I.; for this brim, which is incomplete in the osseous state, is here perfect, by the continuation of the cartilage, that is partly ligamentous at 10, opposite the obturator foramen.

The use of this ligament is to connect the os femoris with the os innominatum, and to confine the synovial juice.

The acetabulum r is lined with cartilage, excepting where the synovial gland R is placed. This is a beautiful glandular tissue extremely vascular, its vessels deriving their origin from the obturator *d*, and running beneath the cartilaginous ligament 10; for there remains still a foramen. Its function is to secrete the synovial fluid.

The ligamentum teres* B, in *Fig.* 2 of Plate XVII., situated within the capsular ligament of the hip-joint, extending between the head of the os femoris and the acetabulum, is attached by a circular arrangement of ligamentous fibres condensed into the small round depression a little pubic of the centre of the head *b* of the os femoris. From this the fibres expand or radiate, to be attached to the bottom of the acetabulum, which looks pubic, and also to the ligamento-cartilaginous ligament 10, which completes the brim of the acetabulum. This ligament has sometimes the appearance of being double.†

* Syn. Ligamentum teres capitis femoris: Ligamentum rotundum: Le ligament inter-articulaire.

† As the hip-joint admits of motions similar to those performed at the shoulder, and as the pelvis and os femoris cannot so readily accommodate themselves to each other's motions as the scapula and os brachii, we should imagine that the hip-joint ought to be more frequently luxated than the shoulder-joint. We have, however, only to recollect, that the head of the thigh bone is sunk deep into the acetabulum; that the thigh bone forms an angle with its shaft and neck, the head of which is a fulcrum wedged into the acetabulum of the pelvis, and firmly retained there by ligaments and muscles, while the actions which these muscles perform are less irregular and extensive than those at the shoulder.

The hip-joint is subject to the following kinds of luxation; first, the head of the os femoris may be dislocated upwards and backwards, or, according to Dr. Barclay's excellent nomenclature, atlantad and sacrad, on the dorsum of the os ilium; secondly, it may be driven sacrad and coccygead on the great sacro-ischiadic notch; thirdly, it may be forced downwards and inwards, or distad and pubic, on the obturator foramen; and fourthly and lastly, it may be pushed upwards and forwards, or atlantad and pubic, on the os pubis, near the point of junction between the os pubis and the os ilium. The head of the os femoris has seldom or ever been forced directly downwards on the tuberosity of the os ischium, or a little coccygeal to the tuber. Of these different directions, the first and third are those which commonly occur, and indeed the only ones the surgeon need make himself master of, as the deviations will be readily comprehended if these are thoroughly understood.

When we consider the obliquity of the plane of the pelvis where the acetabulum is situated, and the line of direction of the neck of the os femoris, as well as the direction of the thigh bone itself, it will appear evident that luxation will most commonly take place upwards and outwards on the dorsum of the os ilium.

Its use is to connect the os femoris with the os innominatum.

When the first of these takes place, or the head of the thigh bone is forced atlantad and sacrad, the capsular ligament is ruptured, and to a greater or less extent lacerated; an event which must occur in all the luxations of this joint, in consequence of the tenseness and unyielding nature of this ligament. The round ligament is also too short to extend to this distance, and is consequently torn. The gluteus minimus muscle, from the shortness of its fibres, and their adhesion to the capsular ligament, must also be more or less injured. The quadratus femoris and the obturator externus et internus, with the gemelli muscles, from the shortness of their fibres, and from being violently stretched, are also liable to be torn; and for the same reasons the proximal or superior fibres of the great head of the triceps muscle. The gluteus maximus and medius, the pyriformis, the long head of the biceps, the semi-tendinosus and semi-membranosus, the three heads of the triceps, with the exception of the superior fibres of the adductor magnus, the gracilis, the rectus femoris, and the sartorius muscles, will be relaxed by their extremes being approximated. The only muscles, therefore, thrown on the stretch, are the psoas magnus, the iliacus internus, the pectinalis, the obturator externus et internus, with the gemelli, the quadratus femoris, and the superior fibres of the adductor magnus. These, with the exception of the obturator internus and gemelli, are all adductors of the limb, and rotators fibulad; but the limb is shorter, the knee a little thrown across the other limb, with the toes turned inwards or tibiad, and resting on the sound foot. The shortening of the limb is at once accounted for, and also the adduction to the sound one. But why rotated inwards? This can only be satisfactorily accounted for by the natural position of the bones; it is also assisted by the anterior or pubic fibres of the gluteus medius being thrown on the stretch, and pulling the trochanter major forwards or pubic. The pubic fibres of the gluteus minimus, if left sound, and the strong pubic fibres of the capsular ligament, if entire, will assist the gluteus medius in giving this direction; for the head of the bone is pushed sacrad, while the trochanter major looks pubic.

The means to be employed in reducing this luxation are the same as those directed for dislocation of the shoulder-joint. A wet hand towel is to be applied round the thigh immediately above the knee-joint, and to this is affixed the two ends of a dry towel folded diagonally, the middle or noose of which is to be afterwards thrown round the shoulders of the operator, like the belt of a soldier's cartouch box. The patient standing erect on a mattress laid on the floor, is to be bled in the arm to syncope; and the moment he is prostrated, the surgeon throws the noose of the dry towel over his head, puts his foot on the perineum of the patient, which should be previously cushioned, and then gradually extends, abduct-

After the examination of the ligaments of the hip-joint, either those of the pelvis or of the knee may be investigated; I shall begin with the former.

ing the limb so as to direct the head of the os femoris into the acetabulum. I have never tried this mode of reduction, but have been able to reduce this kind of dislocation after syncope has taken place from blood-letting, simply by means of an assistant, who bound up the arm, while I extended the leg. If syncope does not take place, or if the patient immediately recover, a grain of tartar emetic should be given every ten minutes, till extreme nausea ensue, when extension should be again tried. If the warm bath is at hand, it may be used to produce fainting. When the luxation has taken place beyond a day or so, the pulley apparatus should be adopted; and for a clear description of its application, I beg to refer the reader to Sir Astley Cooper's excellent work on Fractures and Dislocations. After reducing any luxation of the hip-joint, the limbs should be so tied, as to prevent the bone from slipping out.

When the head of the os femoris is forced on the greater sacro-ischiadic notch, between the gluteus medius and pyriformis muscles, it is further removed from the acetabulum; consequently there is a greater extent of injury done to the capsular and round ligaments, and also to the muscles, than in the preceding luxation. The capsular ligament is almost entirely or totally lacerated around, the round one is torn across, the gluteus medius considerably destroyed, the pyriformis, obturator internus, gemelli, quadratus femoris, superior fibres of the adductor magnus, pectinalis and obturator externus, are all more or less injured, which must arise from the trochanter major looking pubic, while the head of the thigh bone points sacrad; and this must depend on the anterior or pubic fibres of the gluteus medius pulling the trochanter major in this direction. The same muscles will be relaxed and thrown on the stretch as in the preceding luxation; so that the position of the limb is nearly the same, only it is shorter, with the knee and toes turned tibiad or inwards, but not so much as in the former, and with the great toe resting upon that of the other foot.

The manner of reduction is the same as in the foregoing case, with this difference, that when extension has begun, the hands of an assistant, or a towel, should be put on the inside or tibial aspect of the top or proximal extremity of the thigh close to the joint, to elevate the head of the thigh bone over the high brim of the acetabulum.

The third direction of displacement of the head of the os femoris, is on the obturator foramen, in which case the capsular ligament is ruptured, and more or less lacerated round; but the ligamentum teres sometimes remains sound, although it is in general torn. The obturator externus, the pectinalis, the adductor brevis, the gluteus minimus, the pyriformis, obturator internus, gemelli, and quadratus femoris, must be all more or less injured. The three heads of the triceps, the inner

In *Fig.* 2 of Plate XVII. the obturator ligament* u, consisting of a variegated arrangement of fibres, is obser-

and outer hamstring muscles, the gluteus maximus and medius, and the psoas magnus, with the iliacus internus, will be overstretched. The limb is rendered longer from the simple position of the bones, and is a little abducted by the greater power of the glutei; and also rotated slightly outwards or fibulad by the rotators in this direction being more powerful than their antagonist rotators tibiad. The patient bends his body forwards to relax the psoas muscle, the anterior crural nerve, and the blood-vessels; he cannot put his heel to the ground, in consequence of the flexors of the knee-joint being overstretched and bending a little the knee, which is advanced, and far separated from the other, while his toes touch the ground.

Reduction of this accident may be accomplished without blood-letting, but this remedy, in my opinion, so completely removes all the pain caused by extension, that it should never be omitted. When the patient, therefore, has fainted, and is prostrate on a sofa or mattrass laid on the floor, let the surgeon place his knee on the inside or tibial aspect of the top of the affected thigh close to the joint, and then with his hands lay hold of the limb at the ancle, and bring the limb across towards the other, when the head of the thigh bone will slip into the acetabulum. Care must be taken not to adduct the affected limb too much, as the head of the os femoris may start over the outer or sacral margin of the pelvis, and form a worse luxation, which, should it happen, is to be instantly reduced, as directed above. If these directions should not succeed, let the patient be fixed with the pullies, and the affected limb adducted, while an assistant acts with his hands as directed in the luxation on the greater sacro-ischiadic notch.

The fourth and last direction is atlantad and pubic on the os pubis. In this, the capsular ligament is ruptured and more or less lacerated around, the ligamentum teres is also torn across, and the gluteus minimus must likewise be injured, as well as the iliacus internus and psoas magnus, beneath which the head of the bone burrows. The limb is shortened from the position of the bones, the knee and foot rotated outwards or fibulad from the glutei, the pyriformis, the obturator internus, the gemelli, the quadratus femoris, the superior fibres of the adductor magnus, the iliacus internus and psoas magnus muscles being thrown on the stretch; while the pectinalis, the three heads of the triceps, and all the hamstring muscles, are relaxed. The knee is also widely removed from the other, partly from the position of the bones, and partly from the abductor muscles mentioned above being overstretched; the great toe can touch the ground, but the heel is retracted; and the head of the os femoris is felt upon the body of the os pubis.

The

* Syn. Ligamentum obturans foraminis ovalis: Obturator membrane: Membrana obturans foraminis thyreoidis ossium coxæ.

ved to fill up the obturator foramen; part of the obturator externus muscle D being left attached to the margin of

The mode of reducing this should be the same as in the last; but in the event of its failure, the patient ought to be placed on his sound side, and fixed by a cushioned roller put between his thighs, or on the perineum, and fastened by ropes and a staple in the wall, then the pullies applied to the thigh, and the limb extended backwards and downwards. After the extension has been continued for a little while, a towel should be put round the upper part of the thigh close to the joint, and the noose over the shoulders of the operator; with this the head of the thigh bone is to be raised over the margin of the acetabulum, the operator, in the meanwhile, pressing down the pelvis. For further information on luxations of the hip-joint, consult Sir Astley Cooper on Fractures and Dislocations, Dublin Hospital Reports, Boyer Traité des Maladies Chirurgicales, and Hey's Surgical Observations.

These varieties of luxation of the hip-joint are liable to be confounded with fracture of the neck of the os femoris, particularly the first or the displacement of the thigh bone on the dorsum of the os ilium, and even that on the body of the os pubis, if the practitioner be not very careful. In fracture of the neck of the os femoris within the capsular ligament, there is a fair trial of strength between the different classes of muscles around the joint, and as the extensors, abductors, and rotators fibulad, are much more powerful than their antagonist flexors, adductors, and rotators tibiad, the limb is consequently shortened, slightly abducted, and rotated outwards or fibulad. When the limb is extended the length of the other, and rotated inwards, a crepitus is generally observable. This fracture is to be treated on the principles laid down in the pathological observations of Part I., with this difference, that after the inflammatory action has been subdued by leeches and warm anodyne fomentations, &c. the limb is to be kept extended on the double inclined plane, or by the common fracture-box in hospitals, and a broad belt to be applied round the pelvis, including the trochanter major of the affected limb, so as to keep the fractured ends in apposition. This part of the bone unites only by ligament, as already mentioned in Part I., therefore the powerful extensors drag the trochanter major upon the dorsum of the os ilium, the gluteus medius pulling it forwards or pubic, until the limb assumes the same appearance as in luxation on the dorsum of the os ilium. A well marked case of this description occurred a few years ago, and deceived the late celebrated Mr. John Bell, another surgeon, and myself. The patient was upwards of sixty years of age, and had only tumbled out of a low truckle-bed, and fractured the cervix of the os femoris, within the capsular ligament. Some months after the accident, Mr. Bell saw him, when the appearances so clearly indicated luxation of the head of the os femoris on the dorsum of the os ilium, that we put the poor man twice to the torture of extension. In a few months after this he died, when to my great surprise and regret I found a fracture

the bone forming the aperture. This ligament is attached all round to the margins of the bones of the pubes and ischium which form the foramen, but a hole is left under the os pubis, near its junction with the os ilium, for the passage of the obturator nerve 21, artery *d*, and vein d. This ligament forms part of the walls of the pelvis, thereby supporting the viscera, and affording origin to the two obturator muscles.

In *Fig.* 1 of Plate XVII., and *Figs.* 1 and 2 of Plate XVIII., the two sacro-ischiadic ligaments H, h, are represented, the longer being marked H, the shorter h. The longer ligament* H, which is also broader, and situated more dermal or superficial than the other, arises from the tubercle and oblong flat surface *g* on the dorsum of the os sacrum, which are formed by the two lower transverse processes, also from the contiguous surface of the

of the neck of the thigh bone. I have preserved the joint, and deposited it in my Museum. Verduc, Paré, and Petit were also deceived in their diagnosis of luxation and fracture of the neck of the os femoris. For further information on this subject, see Sir Astley Cooper on Fractures and Dislocations, and Colles in Dublin Hospital Reports.

In morbus coxarius, the functions of the muscles around the joint are clearly displayed. In this disease, inflammation and suppuration of the ligaments and synovial membranes first take place, then relaxation of the muscles, when the head of the thigh-bone descends downwards, and the limb becomes elongated with the toes turned outwards or fibulad. This stage is of short duration, as the extensors soon begin to act, pulling the head of the os femoris upwards on the dorsum of the os ilium, thus rendering the limb shorter, and turning the toes inwards or tibiad, as if there was a luxation in this direction. During the inflammatory stage, a great number of leeches should be applied, or the part cupped repeatedly, and followed by warm opiate fomentations and poultices, with rest rigidly enjoined. If these fail, eschar after eschar should be made, either with the actual cautery or caustic, and healed as quickly as possible.—See Part V., page 121. In old age, a communication is frequently established between the bursa mucosa of the psoas magnus, and the interior of the joint, by the capsular ligament being worn through.

* Syn. Large, posterior, or external sacro-ischiatic ligament: Ligamentum tuberoso-sacrum, sive ligamentum sacro-ischiadicum majus.

os sacrum, and even the coccyx *b*. From this broad extent of origin, the fibres run converging to the tuberosity z of the os ischium to which they are attached, and where they again expand. The use of this ligament is to connect these bones of the pelvis, to support the pelvic viscera, to limit the outlet of the cavity, to afford origin to the gluteus maximus muscle, and to assist in forming the less sacro-ischiadic notch or foramen.

The short sacro-ischiadic ligament* h, in Plates XVII. and XVIII., situated more centrad or pelvic than the other, derives its origin from nearly the same point of the os sacrum, but not from such an extent of surface, and runs transversely, to be attached to the spine of the os ischium. This ligament assists in shutting up the pelvic cavity, supports the viscera contained therein, forms part of the greater and less sacro-ischiadic notches or foramina, and affords origin to the coccygeus muscle.

The os coccygis *b*, in *Fig.* 1 of Plate XVII., and *Fig.* 2 of Plate XVIII., is connected to the os sacrum by a broad ligamentous expanse, which is stronger and more conspicuous on the posterior† aspect or dorsum of the bone, than on the anterior.‡ The former is marked a, in *Fig.* 2, Plate XVIII. The fibres of the sacro-ischiadic ligaments are blended both with the posterior and anterior expanses of this ligament. The use of these ligamentous fibres is to connect the os coccygis with the os sacrum. The separate portions of the coccyx are connected together by intervertebral cartilages, and short

* Small internal or anterior sacro-ischiatic ligament: Ligamentum spinoso sacrum, sive ligamentum sacro-ischiadicum minus internum.

† Syn. Ligamenta postica ossium coccygis. Ligamentum capsulare coccygis: Le ligament sacro-coccigien posterieur.

‡ Ligamenta priora ossium coccygis. Ligamenta longitudinalia coccygis, &c. Le ligament sacro-coccigien antérieur.

intervertebral or corruscating ligaments. Similar to this ligamentous expanse of the coccyx, is one which invests the sacrum and ossa innominata; and where there is an articulation, such as the sacro-iliac synchondrosis *f*, *Fig.* 1, Plate XVIII., it is entitled to the name of a ligament, but elsewhere it is merely the periosteum. It is this which reduces in magnitude the foramina in the sacrum which transmit the several nerves; and also runs along and around the ventral aspect of the crista S of the os ilium onwards to the symphysis pubis,* surrounding this symphysis.† The former, named lacertus ligamentosus, is marked q; the production of the latter, which encircles the membranous portion of the urethra, will be described under the male organs of generation.

The posterior or dorsal aspect of the sacro-iliac synchondrosis has some powerful ligamentous bands,‡ marked *z* in *Fig.* 2 of Plate XVIII., extending between the posterior superior spinous process *f* of the os ilium and the os sacrum, the use of which is evidently to connect these bones.§ Some ligaments, nearly of equal strength, extend between the crista S of the os ilium, and the transverse processes of the two or three inferior or sacral lumbar vertebræ,‖ and the superior transverse process of the os sacrum. These ligaments are marked k in *Fig.* 2 of Plate

* Syn. Lacertus ligamentosus.

† Syn. Annular ligament.

‡ Syn. Ilio-sacral ligament: Ligamentum posticum longum et breve ossis coxæ: Le ligament sacro-iliaque et le ligament sacro-epineux supérieur et inférieur.

§ These ligaments have been found occasionally to be relaxed in parturition, and have been torn in luxation of this articulation.

‖ Syn. Transverse ligaments: those attached to the lumbar vertebræ are named superior, while that to the sacrum is styled inferior. The latter is also sometimes denominated ligamentum laterale posticum ossis coxæ; and the superior, ligamentum pelvis anticum superius et inferius; also, le ligament ilio-lombaire et le ligament sacro-vertébral.

XVIII. The short ligamentous bands, marked *i*, in *Figs.* 1 and 2 of Plate XVIII. extending between the os sacrum and os ilium, both on the anterior or pubic, and on the posterior or dorsal, are named ligamenta vaga.*

The capsules of the articular processes of the vertebræ are delineated in *Fig.* 2 of Plate XVIII. marked 2,† surrounding the articular processes of each two vertebræ, so as to connect them together.

In *Fig.* 3 of Plate XVIII. the common anterior ligament of the vertebræ‡ is delineated, marked *a*, extending along the anterior or sternal aspect of the vertebræ. It begins at the atlas, ends at the coccyx, and consists of a longitudinal arrangement of strong ligamentous fibres, which bind the vertebræ to each other. Beneath this longitudinal arrangement of fibres a crucial is found, which is represented in *Fig.* 1 of Plate XVIII., marked b. These crucial or intervertebral ligaments extend between the bodies of each two contiguous vertebræ, crossing each other obliquely, and thus binding the vertebræ still more securely together.

In *Fig.* 3 of this Plate, are depicted two of the capsules of the heads of the ribs,§ marked c; these surround the heads of the ribs, and are attached to the sides of the bodies of the vertebræ, encircling the smooth depressions formed between each two contiguous vertebræ. The superior is left entire, while the inferior is laid open. These con-

* Syn. Ligamenta accessoria, vaga, postica ossis sacri. Les ligamens sacro-iliaques antérieurs.

† Syn. Ligamenta processuum obliquorum vertebrarum. Capsular ligaments.

‡ Syn. Ligamentum corporibus vertebrarum commune anterius, sive fascia longitudinalis anterior. Le grand surtout ligamenteux antérieur de la colonne vertebrale.

§ Syn. Ligamentum capituli costarum. Capsular ligaments of the heads of the ribs. Les ligamens rayonnés.

nect the heads of the ribs with the bodies of the vertebræ.

I shall now proceed to the description of the ligaments of the knee-joint, although some of the muscles situated on the back of the leg should be first examined. My reason for adopting this arrangement is, that the drawings of this joint precede those of the leg. In Plate XIX. the anterior or patellar aspect of the knee-joint is delineated, *Fig.* 1 being a representation of the exterior, and *Fig.* 2 one of the interior of the joint. In *Fig.* 1, the letters *l* and *o* indicate the expanse of the fascia lata united with the cellular envelope of the vasti muscles, as described in page 125 of Part V, which is laid open and reflected, to bring into view the patella Y, with its ligament *y*. This patellar ligament* *y*, situated on the anterior or patellar aspect of the knee-joint, extends between the distal point or apex *d* of the patella, and the tubercle d of the tibia. The attachment to the tubercle of the tibia is represented in *Fig.* 2 of Plate XX., the ligament being reflected downwards and truncated. This ligament is remarkably thick and strong, and forms the connecting link between the muscles on this aspect of the thigh and the bones of the leg.† Beneath it, near the patella Y, a bursa mucosa is found, and is marked *g*, in *Fig.* 1 of Plate XIX. ‡

* Syn. Anterior ligament of patella : Ligamentum patellæ : Le ligament inférieur de la rotule.

† The patellar ligament is concerned in fracture of the patella, and in luxation and other injuries and diseases of the knee-joint, as will be immediately explained.

‡ This bursa is liable to be affected with a superabundant secretion of mucus, with matter forming a chronic abscess, with cartilaginous substances, and with hydatids. In either of the two former cases, a small opening and bandage will generally cure the disease ; but if no remedies are used, the joint may become involved, and lead to serious consequences. In the two latter, the bursa requires a freer opening, to extract or discharge these substances.

The popliteal ligament,* marked 10, in *Figs.* 1., Plates XX., XXI., XXII., and XXIII., situated beneath or centrad to the outer heads R, R, of the gastrocnemius muscle, the plantaris U, and the popliteus V muscles, extends between the external or fibular condyle *n* of the os femoris, and the popliteal aspect of the head of the tibia, marked *i*, and adheres to the capsular ligament in its course. The use of this ligament is to assist in connecting the tibia and os femoris together, and in limiting extension of the knee-joint.†

The internal or tibial lateral ligament,‡ marked 2 in *Figs.* 1, Plates XX., XXI., XXII., and XXIII., situated on the tibial aspect of the knee-joint, begins by a broad origin from the internal or tibial condyle *m* of the os femoris, descends adhering to the capsular ligament, and is attached to the tibia a little below its head, being covered by the tendinous insertions of the sartorius E, the semi-tendinosus M, and the gracilis Q muscles.§ The use of this ligament is to connect the tibia and os femoris together, and to prevent rotation of the joint.

The external or fibular lateral ligament,‖ marked 3 in *Figs.* 1 and 2, Plate XIX., and *Figs.* 1, Plates XXI., XXII., and XXIII., situated on the fibular aspect of the knee-joint, generally consists of two slips, both of which arise from the external or fibular condyle *n* of the os femoris; but the one is inserted in the head of the fibula 6, and is the longer; while the other is

* Syn. Ligamentum posticum · Posterior ligament of Winslow.

† The popliteal ligament is concerned in luxation and other injuries and diseases of the knee-joint.

‡ Syn. Ligamentum laterale internum genu.

§ The internal lateral ligament is concerned in luxation and other injuries and diseases of the knee-joint.

‖ Syn. Ligamentum laterale externum genu longum et breve.

attached to the head of the tibia, is the shorter, adheres to the capsular ligament, and is sometimes deficient.* The subject from which the drawings were taken, though bold and muscular, had no tibial slip. The use of this ligament is to connect the fibula and tibia to the os femoris, and to prevent rotatory motion of the joint.

These four ligaments, the patellar, the popliteal, with the internal and external lateral ligaments, are all that are situated exteriorly to the capsular ligament of the joint.

In *Fig.* 2 of Plate XIX. a circular incision has been made through the integuments and muscles of the thigh, immediately above or proximad to the bursa mucosa, 1, and the capsular ligament† 4 laid open by an incision being made near its attachment around the condyles M, N, of the os femoris, while the patella 5, with the bursa mucosa 1, and the fleshy insertions of the rectus, crureus, and two vasti muscles, are reflected, so as to bring into view the interior of the joint. In Plate XX., *Fig.* 2, the patella, the mucous ligament, and synovial gland, are removed, and the lateral ligaments divided; while *Fig.* 3 is a popliteal view of this joint, the capsular ligament 4 being cut across. The capsular ligament 4 is attached round the condyles M, N, of the os femoris, as represented in *Fig.* 2 of Plate XIX., and *Figs.* 2 and 3 of Plate XX.; from this extent of surface it descends, embracing the patella 5, to the sides of which it is also attached, and the interarticular cartilages 13, 14, in *Fig.* 2 of Plate XX., to be inserted round the head of the tibia *a*, in *Figs.* 2 and 3 of the same Plate. The use of this ligament is to connect the tibia and os femoris, to

* The external lateral ligament is concerned in luxation and other injuries and diseases of the knee-joint.

† Syn. Membrana capsularis articuli genu: La membrane synovial.

support the patella, and to confine the synovial juice, which it partly secretes.*

The chief synovial gland of this joint is seen in *Fig.* 2 of Plate XIX., marked 7, situated on each side of the apex of the patella, and supported by its delicate ligament 8, named mucous,† which descends from the notch between the condyles M, N, of the os femoris. Besides this, there are several smaller glandular tissues situated within the capsular ligament, as that marked 9 both in this figure and in *Figs.* 2 and 3 of Plate XX.

In *Fig.* 2 of Plate XIX. there is observed a delicate ligament, marked 10, on each side of the patella 5, which is merely a thickening of the capsular ligament, although it has obtained the name of alar.‡

In *Fig.* 2 of Plate XX., the mucous, the capsular, and the lateral ligaments have been divided to bring into view the crucial ligaments,§ which are two in number, the one being placed anteriorly to the other. The anterior or patellar crucial ligament 11, arises from the external or fibular depression in the side of the notch of the os femoris, and descends crossing the posterior crucial ligament 12 on its anterior or patellar aspect, to be attached to the little elevation nearly in the centre of the head of the tibia, anteriorly or patellad to the posterior ligament. The posterior or popliteal crucial ligament 12 arises from the internal or tibial depression in the side of the notch of the os femoris, and descends crossing the anterior ligament 11 on its posterior or popliteal aspect, to be attached

* The capsular ligament is concerned in luxation and other injuries and diseases of the knee-joint.

† Syn. Ligamentum mucosum Frenulum. Le ligament adipeux.

‡ Syn. Ligamentum alare majus et minus.

§ Syn. Ligamenta cruciata, anterius et posterius Internal ligaments of knee-joint Ligamentum cruciatum anticum et posticum Les ligamens croisés.

to the popliteal aspect of the head of the tibia. This point of attachment is represented in Part I., Plate VIII., *Fig.* 8, letter *g*. In *Fig.* 3 of Plate XX. the capsular ligament is cut across, so as to expose the popliteal aspect of these ligaments.* The crucial ligaments prevent any rotatory motion, and limit the extension of this joint.

The semilunar interarticular cartilages 13, 14, in *Fig.* 2 of Plate XX., situated between the condyles M, N, of the os femoris, and the smooth depressions *c*, *c*, on the head of the tibia, extend around these depressed surfaces *c*, c, having their thin edges looking towards these, and their thick margins adhering to the capsular ligament 4, so as to deepen these hollows in order to receive the condyles M, N. Each of these cartilages 13, 14, is fixed by a short ligamentous prolongation† from their anterior cornu to the head of the tibia, at the side of the insertion of the anterior crucial ligament 11. They are tied to each other, anterior to the insertion of the anterior crucial ligament, by a short transverse ligament† 15; and their posterior cornua are attached to the tibia posteriorly or poplitead to the insertion of the posterior crucial ligament 12, along which they send upwards a ligamentous production,† attaching them to the depression between the condyles of the os femoris. The digits 12 in *Fig.* 3 properly indicate this ligamentous production of these cartilages, enveloping the posterior crucial ligament. The cartilages are thus admirably kept in their place by these ligamentous bands, and move always along with the tibia in flexion and extension of the knee-joint.‡

* The crucial ligaments are concerned in luxation and other injuries and diseases of the knee-joint.

† Syn. Ligamenta cartilaginum lunatarum.

‡ When the patella is fractured across, there is always more or less lesion of the capsular ligament and tendinous aponeurosis of the fascia lata and muscles, and more or less retraction of the upper or proximal portion of the bone, in consequence

The trochlear surfaces of the condyles of the os femoris, the surface of the head of the tibia, and the surface of

of the insertion of the rectus, crureus, and two vasti muscles. This accident is easily recognised, and requires to be treated on the same principles as those laid down in Part I. The limb is to be placed in the easiest attitude for the patient, freely leeched, fomented, and poulticed, until all inflammation has been subdued; then to be extended, with the trunk of the patient so elevated as to relax the rectus muscle. One bandage should be applied round the loins, and carried downwards to the fractured patella, while another should be rolled from the ankle upwards to the same point, so as to approximate the fractured ends, and keep them in that position. Like the fractured cervix ossis femoris, there results merely ligamento-cartilaginous union. Passive motion should be used at the end of five or six weeks. In compound fracture of the patella, as the joint is generally laid open, and there is a great extent of inflammatory surface, amputation becomes a matter of consideration for the surgeon. Should this not be considered requisite, general and topical blood-letting ought to be boldly employed, followed by anodyne fomentations and poultices.

The insertion of the conjoint tendon of the rectus and crureus muscles is occasionally lacerated from the patella, and the patellar ligament is sometimes torn through. In both of these cases, the treatment should be the same as that recommended above for transverse fracture of the patella, modified according to circumstances.

The patella is generally luxated outwards or fibulad, seldom inwards or tibiad; but in either case the limb should be extended, and the trunk bent to an acute angle on the thigh, when a little pressure on the projected patella will reduce it. Leeches and fomentations should be used after reduction, since the capsular ligament is more or less injured.

The tibia may be luxated either laterally, or forwards, or backwards, the one laterally being incomplete; but these are accidents which seldom occur. Either of these accidents is easily known, and only requires extension to reduce it, which is commonly accomplished with facility. Topical blood-letting, fomentations, and rest, are generally required, and afterwards proper support by bandage. In compound luxation of this joint, amputation requires almost invariably to be adopted.

The capsular and small ligaments supporting the interarticular cartilages become sometimes so relaxed as to permit these bodies to be displaced. From the configuration of the condyles of the os femoris, the internal or tibial being longer, while the external or fibular is shorter, the external or fibular interarticular cartilage is the one which usually slips out, and allows the condyle to rest on the surface of the tibia. In this derangement, the patient cannot perfectly extend the limb. To reduce the cartilage, the leg must be bent on the thigh as much as possible, then

the patella looking to the interior of the joint, are all covered with cartilage.

the cartilage replaced by the fingers, the leg extended, and a knee-cap laced tightly around the knee with a strong leather strap immediately over the cartilages. Occasionally, while the leg is bent on the thigh, it is requisite to rotate the thigh tibiad, and the foot fibulad, in order to replace the cartilage. This peculiar disease arises frequently from effusion into the joint, and then the treatment must be by blisters, rubefacients, compresses, and bandage.

The knee-joint, from its exposed and depending situation, is peculiarly liable to be wounded; and whether it be a punctured, incised, lacerated, or contused wound, the most active antiphlogistic treatment is requisite, in consequence of the great extent of synovial surface, which is very susceptible of inflammation, and because, when once the inflammatory action commences, great difficulty exists in subduing it. The repeated application of leeches, warm anodyne fomentations and poultices to the joint, the limb being gently extended to relax the ligaments, perfect quietness, and general blood-letting, are the means to be employed, modifying them according to circumstances. In wounds, blood is occasionally effused into the joint; and if inflammation be averted, there is little danger to apprehend, the blood being readily absorbed. This is assisted by frictions and bandage.

The knee-joint is more susceptible than any other of being affected with floating loose cartilaginous bodies, which are sometimes suspended by delicate ligamentous bands. These substances must be originally attached to some part of the joint, otherwise they could not grow; but by motion or contusion their delicate pedicle is ruptured, and then they float about, and frequently run between the condyles of the os femoris and the concavities of the head of the tibia, so as to lame the individual. The laced knee-cap generally so confines them as to prevent their proving troublesome in walking, and evidently should be persevered in before excision is had recourse to. When the latter is found necessary, the patient should be confined to bed for a day or so previously, and have a cathartic administered; the cartilaginous substance should then be pressed towards one side of the patella, and there held firmly by an assistant, while the operator drawing the skin downwards or upwards or to one side, makes a longitudinal incision over the substance, and extracts it either with the fingers, forceps, or a hook. The skin is instantly to be allowed to retract, the lips of the wound are to be held together by adhesive plaister, and the nine-tailed bandage applied, the limb being gently extended, and perfect rest with low diet enjoined. On the slightest appearance of inflammation, leeches, warm anodyne fomentations, and poultices, with general blood-letting, should be adopted.

From the preceding observations it will be at once apparent, that inflammation of the knee-joint is no uncommon occurrence, and that its treatment will be the

I shall now proceed to the description of the muscles of the leg, and shall begin with those situated on the

same as already recommended in wounds of this joint. In inflammation of a joint, there is always an increased secretion of the synovial fluid, only of a more watery or serous nature, which tends to moderate the inflammatory action. This when profuse, and after the inflammation has subsided, constitutes dropsy of the joint. Friction, compresses, and bandage, are the best remedies. Sometimes blisters are requisite, and require to be kept open by issue ointment. If the inflammation be severe, and do not terminate in effusion, or be not subdued, suppuration ensues; a result which I have seen follow rheumatism, and which is always accompanied by hectic fever. If in this termination the matter does not soon discharge itself by ulcerous openings, the surgeon ought to make a small puncture with a lancet, then apply two rollers to the limb, the one from below, and the other from above, meeting at the puncture in the joint, otherwise the matter will spread upwards along the popliteal aspect of the thigh, and downwards along the leg, or it will excite by its pressure ulceration of the cartilages. Nourishing diet with perfect rest should be enjoined. Sometimes the cartilages and ligaments, and even the ends of the bones, as well as the capsular ligament ulcerate, so as to leave no chance but anchylosis or amputation. In the scrofulous constitution, the least injury to this joint too often produces such an increased action and local determination to the part, that inflammation recurs successively, until such excitement is established that hectic fever ensues, and carries off the patient. At first there is merely slight inflammation, but afterwards thickening of the cartilages and ligaments, then ulceration and absorption, and lastly caries of the bones, with profuse suppuration of a purulent shining coagulated matter. There is a large quantity of viscid lymph diffused throughout the cellular substance, which is soft and thick; and a peculiar alteration in structure of the tendinous and adipose substances around the articulation, which constitutes the chief part of the swelling, accompanies these from the beginning, and from the skin remaining generally pale, has been named white swelling. In some cases the integuments ulcerate and discharge the fluid from the joint. This disease seldom attacks the constitution after manhood, or the twenty-fifth year. In the beginning of this fearful malady, the most active antiphlogistic treatment, such as that recommended in wounds of this joint, should be had recourse to, with long confinement in bed, the knee being gently extended in a common fracture box, or on the double inclined plane. If this succeeds in subduing the inflammation, compresses and bandage should be applied; but if it does not, eschar after eschar should be made, either with the actual cautery or caustic, and perfect rest strictly enjoined, along with moderate diet; and anchylosis will then most probably occur. A bandage should be worn even after anchylosis is accomplished for a considerable length of time, also a stiff wooden

posterior or popliteal aspect, because they follow in the arrangement of the plates, and because we have already

box case from the hip to the ankle-joint, to prevent any attempt at motion of the knee-joint. The foot should likewise be supported by a board fixed to this apparatus, having a hinge at the ankle-joint. For this last contrivance I am indebted to my ingenious friend Dr. Vallange, surgeon at Portobello, who invented it for an amiable young gentleman, whose knee-joint I succeeded in anchylosing after it had been doomed to amputation.

The excision of the knee-joint was invented by Park, as an alternative for amputation in cases of white swelling, or caries of the ends of the bones entering into the formation of the joint; and has been, within these few days, performed twice successfully by the ingenious Dr. Crampton of Dublin. Such are the beneficial results accruing from dissection! In performing this masterly operation, a crucial incision through the integuments is made on the patellar aspect of the knee-joint, precisely in the centre, so as that the transverse one may extend between the os femoris and the tibia. The longitudinal one must be proportioned to the extent of the bones to be removed. Each angle of the flap is to be extensively reflected from the patella and capsular ligament, to enable the operator to saw off the ends of the bones. The patella being first removed, the lateral and crucial ligaments should be divided, if not previously destroyed by ulceration, by which means the articulation is dislocated, and the condyles of the os femoris can be made to project on bending the leg on the thigh; the condyles are now to be cleaned slightly at their posterior or popliteal aspect of any ligamentous or muscular fibre, but carefully as relates to the popliteal vessels, and to be sawn from above downwards, or from the patellar to the popliteal aspect, with the common amputating saw; a piece of firm leather, or the handle of the scalpel, or a flexible spatula, being held between the bone and the popliteal vessels, the latter of which are quite secure, if the joint has been so perfectly luxated, as to enable the condyles to project. The common linen or leather retractor will be found useful to keep the integuments out of the way of the saw. If the bone is found diseased further up or proximad, a portion must be removed. The head of the tibia is next to be similarly cleared of ligamentous and muscular fibres posteriorly or poplitead, greater circumspection being required concerning the popliteal vessels, as they approach closer to the bone, in order to give origin to the anterior tibial vessels, which penetrate immediately distad to the popliteus muscle, between the tibia and fibula, to arrive at the patellar aspect of the leg, as represented in Plates XX. of Parts III. and VI. The head of the bone may be so projected, as to be generally sawn from within outwards, or from poplitead to patellad. One or more of the articular arteries may require to be secured. The cut ends of the tibia and os femoris are to be retained in apposition, by placing the limb from the hip to the foot in a tin-box, or in a common fracture-box, without the double inclined plane, for the limb must

had occasion to advert to them; however, I would recommend to the dissector to display those on the patellar aspect first. In the mode of investigating these, I shall pursue the same arrangement as I observed in describing the muscles of the thigh; see page 111 of Part V.

When an incision is made through the integuments and fascia of the leg,* on the popliteal aspect, from the poples to the os calcis, the first muscle which presents itself is the gastrocnemius,† marked R, r, r, in Plates XIX. XX. and XVII. of Part III., and in *Fig.* 1 of Plate XX. of Part VI. This muscle consists of four heads, two of which R, R, derive their origin from the thigh bone, and two, r, r, from the tibia and fibula; the two former R, R, are situated superficially or dermad to the two latter r, r, and all of them unite to form the calf of the leg, and ultimately the tendo achillis *r*.

be set horizontally; a broad leather belt put round the loins, to which is attached a long leather strap, passing down the outer or fibular aspect of the limb to the foot, around the sole of which it runs, the foot being previously furnished with an unyielding soled shoe, to which the strap is to be fixed. the latter, however, is to be continued upwards along the tibial or inner margin of the limb, to the belt round the loins. Each side of the strap should consist of two pieces, with a buckle about the middle to tighten them, and thus enable the foot to be approximated to the thigh, in the event of the apparatus becoming slackened. The preceding apparatus is necessarily prepared before the operation; therefore, whenever the arteries are secured, and the ends of the bones approximated, the loose pendulous flaps are to be held together by stitches and adhesive plaster; and the whole surrounded with a few strips of lint, and supported by the nine-tailed bandage. The intention here is to anchylose the tibia to the os femoris; but sometimes this is not effected, and a tolerable joint is formed. The difficulty is to prevent a too flexible, and hence a useless joint. The first patient who had this dexterous operation performed on him by Park was a sailor, who was afterwards able to do his duty on board.

* The fascia lata, as I formerly remarked, extends downwards along the leg, forming a sheath to the muscles here, the same as for those of the thigh.

† Syn. Gemelli, gastrocnemii internus et externus. Extensor tarsi suralis, vel extensor magnus Gastrocnemii Musculus surae.

The two outer heads R, R, which are named the gastrocnemius externus,* derive their origin from the popliteal aspect of the condyles of the os femoris, between the hamstring muscles, and descend on the leg, uniting and swelling out into large fleshy bellies, which terminate near the proximal third of the leg, where they join the two inner heads r, r, or gastrocnemius internus, to form the tendo achillis *r*, which continues to descend, in order to be inserted into the posterior or popliteal projection of the os calcis D.

The two inner heads, marked r, r, in *Fig.* 1, Plate XX. of Part VI., and in Plates XX. and XIX. of Part III., which are named the gastrocnemius internus,† derive their origin, the one from about the middle third of the tibia, the other from nearly the superior or proximal third of the fibula, and immediately unite and descend, being joined by the carneous fibres of the externus R, R, at the proximal third of the leg, to form the tendo achillis *r*; the fleshy fibres of the internus, however, continue to descend for upwards of two-thirds of the leg, to be inserted into the tendo achillis.‡

The origins of the gastrocnemius externus are deeply seated in the poples, and are chiefly tendinous from the most superior or proximal points of the condyles of the os femoris. The bellies of the externus join the gastrocnemius internus by a strong thin tendinous expanse, as

* Syn. Primus pedem moventium, cum secundo: Primus pedis extremi musculus, cum secundo: Primus movens pedem, cum secundo: Extendentium pedem primus, gastrocnemius externus, gemellus externus: Gastrocnemius: Gastrocnemius externus item gemellus: Gemellus: Grands jumeaux: Biféméro-calcanien.

† Syn. Quartus pedem moventium: Quartus tibiæ musculus: Soleus: Extendentium pedem secundus, gastrocnemius internus: Le soléaire: Tibio-calcanien: Tibio-peronei-calcanien.

‡ The extent of the fleshy fibres downwards or distad should be considered by the operator in amputating the leg.

represented in Plate XX. of this Part, marked R, R. The commencements of the origins of the gastrocnemius internus are not so distinct, in consequence of their being joined together.*

The function of the gastrocnemius muscle is to inflect poplitead the leg upon the thigh or to bend the knee-joint, and to inflect the tarsus poplitead on the leg or to extend the tarsus or the ankle-joint.

The plantaris† U, u, in *Fig.* 1 of Plate XX. of Part VI., and Plate XIX. of Part III., an elegant slender muscle, situated on the popliteal aspect of the leg, between the outer R, R, and inner r, r, heads of the gastrocnemius muscle, derives its origin from the popliteal aspect of the fibular or external condyle of the os femoris, and soon forms a delicate tendon u, which descends obliquely between the outer R, R, and the inner r, r, bellies of the gastrocnemius, to the tibial margin of the tendo achillis *r*, along which it runs, in order to be inserted together with the latter into the os calcis D. The fleshy belly U is round, and of short extent, while the tendon u is long and flat, and towards the tendo achillis *r*, is generally so incorporated

* The gastrocnemius muscle is concerned in amputation of the leg; in the securing of the posterior tibial artery, as described in Part III., page 118; in the securing of the fibular artery, as detailed in Part III., page 120; in luxation of the knee and ankle-joints, and in rupture of its tendon or the tendo achillis. This latter accident is very liable to occur, and is easily recognised. The knee-joint should be bent, and the ankle-joint extended, in order to approximate the attachments, and thus to relax the muscle. A bandage should be rolled from a little above the knee downwards to the ruptured point, and another from around the tarsus upwards, crossing each other, so as to keep the points of the tendon in apposition. To prevent adduction and abduction of the foot, firm splints, or wetted pasteboard, are sometimes used. The individual should remain quiet for upwards of three months, and afterwards wear a strap extending between the heel of the shoe, and a leather collar put around the thigh immediately above the knee.

† Syn. Tertius pedem moventium. Tertius tibiæ musculus. Extensor tarsi minor, vulgo plantaris. Le plantaire ou jambier grêle. Plantaire Petit fémoro-calcanien.

with the latter as to require considerable pains in the separation. When this tendon and the tendo achillis are divided across and reflected downwards or distad, a bursa mucosa is found between them and the os calcis. The function of the plantaris is to bend the knee-joint, and to extend the ankle-joint or the tarsus.*

The popliteus muscle† V, in Plate XX. of Part III., and in *Figs.* 1, Plates XX. XXI. and XXII. of Part VI., situated on the popliteal aspect of the knee-joint, and adhering to the popliteal ligament 10, is a short flattish muscle, which, deriving its origin within the capsular ligament by a strong round tendon from the external or fibular condyle *n* of the os femoris, and becoming fleshy and increasing in breadth instantly on emerging from the joint, descends obliquely across, to be inserted into the tibia a little below its head. The muscle, when first exposed, has a strong tendinous expanse covering its lower or distal half, as delineated in Plate XX. of this Part. In Plate XXII. the muscle is represented emerging from the interior of the joint. The popliteus is almost exclusively a flexor of the knee-joint; for it is only in the sitting posture, when both flexion and extension of this joint are suspended, that the popliteus slightly rotates the tibia.‡

Before proceeding with the more deeply seated muscles on the popliteal aspect of the leg, we must examine some of those on the sole of the foot, as the latter obscure the tendinous insertions of the former. An incision should be made in the centre of the sole of the foot, from the os

* This muscle is concerned nearly in the same operations and accidents as the gastrocnemius, only in a very trifling degree.

† Syn. Musculus in poplite occultatus: Decimus tibiæ musculus: Obliquè movens tibiam, suppopliteus: Le poplité ou jarretier: Femoro-popliti-tibial.

‡ The popliteus muscle is concerned in luxation and other injuries and diseases of the knee-joint.

calcis to the middle toe, through the thick skin and granulated fat, to the glistening silvery tendinous expanse, named fascia plantaris,* which is delineated in Plate XIX. of Part III., marked with the letters Y. The condensed granulated fat and skin are to be reflected towards each side of the foot, until the whole fascia is displayed, when it will be found to arise thick and strong from the os calcis D, and to proceed adhering to the flexor brevis digitorum, the abductor pollicis, and the abductor minimi digiti muscles, onwards to the toes; where becoming more open in its fibres, it sends some to be inserted on each side of the flexor tendons in the heads of the metatarsal bones, and others to be attached to the sheaths of these flexors. The use of this fascia is to support the arch of the foot, to give elasticity to the foot in walking, and to protect the muscles, nerves, and blood-vessels, situated in the sole of the foot.†

The plantar fascia is removed, by carefully detaching its insertions in the heads of the metatarsal bones, beginning either at the tibial or fibular margin, (the former, however, is less difficult), and reflecting it towards the os calcis, until it be found incorporated with the muscles, namely the abductor pollicis B, the flexor brevis digitorum C, and the abductor minimi digiti F, as represented in Plate XX. of Part III.

* Syn. Aponeurosis plantaris. L'aponévrose plantaire.

† The fascia plantaris is concerned in wounds of the sole of the foot, in wounds of the plantar arteries, and in abscesses in the sole of the foot central to the fascia. In the first of these accidents, leeches to the patellar aspect of the foot, followed by hot anodyne fomentations and poultices, applied round the foot, are required; for the second, the reader is referred to Part III. page 119; and for the third or abscess, a free transverse division of the fascia should be made, when if either of the plantar arteries are wounded, compression with dry sponge will stop the hemorrhage.

The flexor brevis digitorum pedis seu sublimis perforatus* C, in Plate XX. of Part III., and C, *c*, in *Fig.* 1, Plate XXI. of Part VI., is the central of the three little muscles exposed on detaching the fascia plantaris, and derives a fleshy origin from the os calcis D, and the fascia plantaris Y; the fleshy belly proceeding onwards to the extent of the middle of the sole of the foot, where it ends in four small tendons which advance to the basis of the first phalanx, each splitting into two slender slips, to give passage to the tendons *o* of the flexor longus digitorum perforans. These double tendons of the brevis are ultimately inserted in the second or medial phalanges of the four lesser toes, as represented in *Fig.* 1 of Plate XXI. of Part VI.; and are along with the tendons of the flexor longus bound down by their vaginal ligaments, as delineated in Plate XIX. of Part III. These tendinous slips are remarkably delicate, particularly those proceeding to the little toe, which are frequently deficient, and which occasionally derive their origin from the tendons of the flexor longus, and even the musculus accessorius. The precise origin is distinctly seen in *Fig.* 1 of Plate XXI., marked also C. The function of this muscle is to bend plantad the first or proximal phalanx of the four lesser toes on the metatarsal bones, and to bend the second or medial phalanx on the first or proximal of these toes.†

The vaginal ligaments‡ of these tendons, seen in Plate

* Syn. Primus pedis digitos moventium: Primus musculos pedis digitis inserviens: Brevis digitum flexor, sive pedieus internus, vel pternodactyleus: Flexor secundi internodii digitorum perforatus: Perforatus: Perforatus, seu flexor sublimis: Le court fléchisseur commun des orteils, ou le perforé du pied: Petit fléchisseur des orteils: Calcanéo-sous-phalanginien commun.

† The flexor brevis digitorum is concerned in luxation and amputation of any of the four lesser toes; and also in amputation across the foot.

‡ Syn. Ligamenta vaginalia tendinum flexorum: Ligamenta vaginalia et cruciata.

XIX. of Part III., and Plates XXI. and XXII., *Figs.* 1, of Part VI., marked in the latter part with the digits 4, are attached to the ridges on each side of the plantar aspect of the phalanges of the toes, thus forming sheaths to the tendons of the flexor longus and brevis, and confining the synovial juice therein secreted; they are somewhat thicker and stronger opposite the joints, and are named cruciata, from having a crucial appearance. Within these vaginal ligaments, small ligamentous slips extend between the phalanges and the tendons both of the flexor longus and brevis, are named accessory ligaments* of the flexor tendons, and are designed to confine or limit the motions of these tendons.

The abductor pollicis pedis† B, in Plate XX. of Part III., obscures also the muscles descending from the popliteal aspect of the leg to the foot, and consequently requires to be previously examined. This muscle is situated on the tibial aspect of the sole of the foot, deriving its origin from the tibial margin of the os calcis D, and running along the same margin of the foot, where it derives additional origin from the os naviculare, and is inserted in the root of the first or proximal phalanx of the great toe. This muscle is partly tendinous and partly fleshy throughout, and consists rather of a scattered arrangement of fibres. It is incorporated at its origin with the flexor brevis digitorum, and the plantar fascia, and in its course adheres to the internal plantar ligament which extends between the os calcis and os naviculare supporting the astragalus to the

* Syn. Vincula tendinum sublimis et profundi accessoria, brevia et longa.

† Syn. Decimus-octavus pedis digitos moventium. Secundus pedis musculus digitis inserviens, pollicem ab aliis digitis deducens. Parvus musculus ad latus pollicis. Pollicem adducens. Abductor pollicis. Portion de l'antithénar. Abducteur du pouce. Abducteur oblique du gros orteil. Metatarso-sous-phalangien du pouce. Tarso-métatarso-phalangien du pouce.

os cuneiforme internum, and the metatarsal bone of the great toe. On the fibular margin near its insertion, this muscle is inseparably connected with the flexor brevis pollicis X, the insertion being, properly speaking, into the tibial sesamoid bone. The points of origin and insertion are clearly seen in *Fig.* 1 of Plate XXI. of Part VI., the former marked n, and the latter h. The abductor pollicis not only abducts the great toe inward, but also bends the first or proximal phalanx popliteal or plantad.*

The deeply seated muscles on the popliteal aspect of the leg may now be investigated.

The *flexor* longus digitorum pedis, seu profundus perforans,† may be seen from its origin to its insertion, delineated in *Fig.* 1, Plate XXI., and marked with the letters O, o, *o*. This muscle situated on the popliteal aspect of the leg and plantar of the foot, derives its origin from the popliteal aspect of the tibia, and interosseous ligament H, and descends with a penniform appearance to the ankle-joint, where becoming tendinous, as at *o*, it advances along the sole of the foot, and forms a junction with the tendon *a*, of the flexor longus pollicis, and the musculus accessorius G; it then divides into four tendons *o*, *o*, *o*, *o*, which run in the vaginal ligaments,‡ and pierce the tendons *c*, *c*, *c*, *c*, of the flexor brevis digitorum, to be inserted by a broad expanse in

* The abductor pollicis is concerned in luxation and amputation of the great toe, and in amputation across the foot.

† Syn. Secundus pedis digitos moventium: Sextus tibiæ musculus: Longus digitûm flexor, sive perodactyleus: Digitorum tertii internodii flexor perforans: Perforans: Perforans seu flexor profundus: Long fléchisseur commun des orteils, ou perforant du pied: Grand fléchisseur des orteils: Tibio-phalangettien commun.

‡ For a description of these vaginal ligaments, see page 176.

the last or distal phalanx of the four lesser toes.* Small ligamentous slips, described in page 177, and named accessory, extend between the phalanges and these tendons. The flexor longus digitorum is also seen in *Fig.* 1 of Plate XX. of this Part, and in Plates XIX. and XX. of Part III. The tendinous slip which unites the tendons of the flexor longus digitorum pedis and the flexor longus pollicis pedis, is generally very strong. As the tendon runs round the malleolus internus *s*, it is bound down by a strong vaginal ligament, as represented in *Fig.* 1, Plate XX., marked o. The flexor longus digitorum extends the ankle-joint, or inflects poplitead the tarsus, bends plantad or poplitead the distal phalanges on the medial, the medial on the proximal, and the proximal on the metatarsal bones, and adducts tibiad the toes or foot, or inflects tibiad the tarsus.

The vaginal ligament† o of the tendon of this muscle, delineated in *Fig.* 1 of Plate XX., extends between the malleolus internus *s*, and the os calcis D, and binds down the tendons of the flexor longus digitorum, the tibialis posticus, and the flexor longus pollicis; although the two latter have also vaginal ligaments peculiar to themselves. It likewise confines the mucus that lubricates the tendon of the flexor longus digitorum.‡

The musculus accessorius ad flexorem longum digitorum pedis,§ marked G, in *Fig.* 1, Plate XXI. of this Part, situa-

* The flexor longus digitorum is concerned in luxation of either of the four lesser toes, and the ankle-joint; in amputating either of these toes, in amputation across the foot, and in that of the leg.

† Syn. Ligamentum lacinatum.

‡ This ligament is concerned in sprains of these muscles, and in luxation of the ankle-joint for the treatment of the former, see page 189.

§ Syn. Pars secundi pedis digitos moventium Pars sexti tibiæ musculi Pars longi digitum flexoris, sive perodactyli Pars digitorum tertii internodii flexoris, perforantis. Massa carnea Jacobi Sylvii. Pars perforantis Pars perforantis

ted in the plantar aspect of the foot, is an oblong carneous mass, deriving its origin from the sinuosity of the os calcis D, and extends a short course along the sole of the foot, to be attached to the tendon o of the flexor longus, at its division into its four tendons.* This muscular mass assists the fleshy belly of the flexor longus digitorum in bending the four lesser toes; and from the tendinous union between the latter muscle, and the flexor longus pollicis, it will also assist this muscle in bending the great toe.

Connected also with the tendons *o* of the flexor longus digitorum, are four small muscles, named lumbricales pedis,† delineated in *Fig.* 1 of Plate XXI. of Part VI., marked k. They arise from the tibial edge of the tendons of the flexor longus digitorum, just at their commencement, and advance to the same aspect of the four lesser toes, where they become tendinous, and are inserted in the tendinous expanse of the extensor longus digitorum, on the patellar aspect of the toes.‡ These muscles assist the tendons of the flexor longus and brevis in bending the first or proximal phalanx of the four lesser toes, and also occasionally assist the extensor longus and brevis of these toes in extending the second or medial phalanx, as well as the third or distal phalanx.

seu flexoris profundi: Accessoire du perforant: L'accessoire du long fléchisseur commun des orteils: Accessoire du grand fléchisseur: Flexor accessorius.

* The flexor accessorius is concerned in forming part of the flap in amputation across the foot between the os astragalus and os calcis, and the os naviculare and os cuboides, as described in page 204.

† Syn. 19, 20, 21, 22, pedis digitos moventium: Quatuor musculi pedis digitis inservientes: Extremi quatuor musculi, quos inter motores digitorum pedis descripsit Vesalius: Lumbricales: Flexores quatuor primi internodii, lumbricales: Lumbricaux des orteils: Les lombricaux: Les quatre planti-sous-phalangiens: Planti-tendino-phalangiens.

‡ The lumbricales having little power, and being extremely small, have almost no relation to surgery. They may be said to be concerned in luxation and amputation of the different joints of the four smaller toes.

The flexor longus pollicis pedis,* A, *a*, in *Fig.* 1, Plate XXI. of this Part, situated on the popliteal aspect of the leg, fibulad to the flexor longus digitorum O, derives its origin tendinous and fleshy from the two distal thirds of the fibula I and the interosseous ligament H, and becomes tendinous, *a*, at the ankle-joint, running in a groove of the os calcis, bound down by a vaginal ligament a, and crossing the tendon o of the flexor longus digitorum, to which it is attached by a strong tendinous slip; the tendon then advances onwards, to be inserted in the last or distal phalanx of the great toe,† running in another vaginal ligament, as represented in Plate XIX. of Part III., and in Plate XXII. *Fig.* 1, of Part VI., marked 4; which sheath resembles those of the lesser toes, marked also 4. The function of this muscle is to bend the ankle-joint or extend the tarsus, to bend poplitead or plantad the two phalanges of the great toe, to adduct or inflect the tarsus tibiad, and by its tendinous union with the flexor longus digitorum, to bend the four lesser toes.

The vaginal ligament‡ a, in *Fig.* 1 of Plate XXI., is attached to the sinuosity of the os calcis and to the astragalus, and binds down the tendon of the flexor longus pollicis, confining at the same time the mucus which lubricates the tendon.

When the flexor longus digitorum and the flexor longus pollicis are removed,§ the tibialis posticus muscle a,

* Tertius pedis digitos moventium: Septimus tibiæ musculus. Pollicis flexor: Flexor pollicis longus· Flexor longus· Le long flechisseur du pouce Le long fléchisseur du gros orteil. Flexor longus hallucis Grand fléchisseur du gros orteil: Péronéo-sous-phalangettien du pouce Péronéo-phalangiuien du gros orteil.

† The flexor longus pollicis relates to the securing of the fibular artery, as described in page 120 of Part III.; is concerned in luxation of the great toe and ankle-joint, and in amputation both of this toe and the leg.

‡ Syn. Vagina ligamentosa flexoris proprii pollicis.

§ Syn. Quintus pedem moventium· Quintus tibiæ musculus Quintus movens pedem. Tibialis posticus. Obliquus moventium pedem primus, adducens pedem,

in *Fig.* 1 of Plate XXII., presents itself, situated on the popliteal aspect of the tibia *a*, from which, and the interosseous ligament m, this muscle arises, and descends adhering to the bone, becoming tendinous near the malleolus internus *s*, in a groove of which the tendon runs onwards to be inserted in the os naviculare *b*. This muscle fills up the vacuity at the proximal part of the interosseous ligament, and has therefore been described by some anatomists as deriving part of its origin from the patellar aspect of this ligament and the tibia and fibula. As the tendon glides round in the groove of the malleolus internus *s*, it is bound down by a strong vaginal ligament, as represented in *Fig.* 1 of Plate XX., marked a, and likewise by a ligament peculiar to itself, so as to confine the mucus which lubricates the tendon. The tendon of this muscle is also seen in *Fig.* 1 of Plate XXI. of Part VI., and in Plates XIX. and XX. of Part III. The insertion generally expands over the os cuneiforme internum *d*, and medium, and also over the contiguous ligaments. The function of this muscle is to extend the ankle-joint or the tarsus poplitead, and to adduct or inflect the tarsus tibiad.*

The next muscle that presents itself in the order of dissection is the transversalis pedis† L, in *Fig.* 1 of Plate XXII., situated, as the name indicates, across the sole of the foot, between the heads of the metatarsal bones of the great and little toe. The tendons of the flexor longus

nauticus, tibiæus posticus: Le jambier postérieur: Tibio-sous-tarsien: Tibio-tarsien.

* The tibialis posticus muscle is concerned in luxation of the ankle-joint, and in amputation across the foot, and of the leg.

† Syn. Decimus tertius digitorum pedis: Musculus transversus: Transversalis: Transversus pedis: Le transversal des orteils: Abducteur transverse du gros orteil: Métatarso-sous-phalanginien transversal du pouce: Métatarso-phalangien du pouce.

and brevis require to be divided and reflected over the toes, to bring the transversalis into view. This small muscle derives its origin from the tibial aspect of the head, or distal extremity of the metatarsal bone of the little toe, and runs obliquely across the heads of the other metatarsal bones, to be inserted in the fibular aspect of the head of the metatarsal bone of the great toe, and also in the sesamoid bone, on the same aspect.* The function of this muscle is to abduct or to inflect fibulad the great toe, and also to approximate the little toe towards the great toe.

Having already examined two of the muscles peculiar to the great toe, situated on the sole of the foot, I shall next describe the flexor brevis pollicis pedis† X, seen in *Fig.* 1, Plate XXI. of Part VI., and in Plate XX. of Part III. This muscle, situated in the sole of the foot, between the abductor pollicis B, and adductor pollicis pedis *q*, in *Fig.* 1 of Plate XXII., being strongly incorporated with these muscles, derives its origin from the sinuosity of the os calcis near its junction with the os cuboides, and from the os cuneiforme externum, or rather from the ligaments connecting these bones, and therefore frequently derives some of its origin from the tendon of the tibialis posticus; the fleshy fibres advance between the abductor and adductor, and are inserted in the sesamoid bones, situated between

* The transversalis pedis has little or no relation to surgery.

† Syn. *Unus ex* musculis primos articulos flectentibus qui tertium musculum pedis in numero succedunt *Unus ex* musculis digitis pedis binos inservientibus *Unus ex* parvis musculis, quorum quatuor collocantur in planta An adducem pollicem, cum pedis maximo intus attensus? Musculus flexionis pollicis consecratus Interosseous · Flexor pollicis brevis Flexor brevis Pars ejus qui le thenar, quoque una cum parte ejus qui l'antithenar Le court fléchisseur du gros orteil. Flexor brevis hallucis Petit fléchisseur du gros orteil Tarso-sous-phalangien du pouce. Tarso phalangien du pouce.

the head of the metatarsal bone and the first phalanx.* The function of this muscle is to inflect plantad the proximal phalanx on the metatarsal bone of the great toe, or to bend the first joint of the great toe.

The third muscle peculiar to the great toe in the sole of the foot, is the adductor pollicis pedis,† seen in Plate XXII., marked *q*, which is situated on the fibular margin of the flexor brevis pollicis, with which it is intimately connected. It derives its origin from the os calcis, the os cuboides, the external or fibular cuneiform bone, and sometimes from the metatarsal bones of the ring-toe, the middle-toe, and even the index-toe; the fibres advance obliquely between the metatarsal bones of the index and great toes, to be inserted in the fibular of the two sesamoid bones situated between the head of the metatarsal bone and the proximal phalanx of the great toe. These small muscles in the sole of the foot are so incorporated together, that they are very perplexing to the dissector. This adductor, properly speaking, arises from the ligaments extending between these tarsal and metatarsal bones.‡ The adductor pollicis inflects the great toe fibulad and poplitead.

The abductor digiti minimi pedis, § marked F, in *Fig.* 1

* The flexor brevis pollicis pedis is concerned in amputation of the proximal phalanx and metatarsal bone of the great toe.

† Syn. Decimus-octavus pedis digitos moventium: Decem musculos singulis digitis pedis binos inservientes: Parvus musculus ad latus pollicis: Pollicem abducens: An huc pertinent musculi in pedio ab ipsius ossibus orti: Alius musculus transversus: Interosseus: Interosseus ad indicem pertingens: Adductor pollicis: Portion interne du muscle thenar: Adducteur du pouce: Calcaneo-sous-phalangien du pouce: Calcaneo-phalangien du pouce.

‡ The adductor pollicis pedis is concerned in luxation of the proximal phalanx of the great toe, and in amputation of this member, as well as amputation across the foot.

§ Syn. Decimus septimus pedis digitos moventium: Tertius musculus digitis pedis inserviens: Parvus musculus ad latus minimi: Musculus minimo digito

of Plate XXI., situated in the sole of the foot, on the same level with the flexor brevis digitorum, and more or less attached to the fibular aspect of this latter muscle, arises from the fibular aspect of the os calcis, and from the plantar fascia, and proceeds along the os cuboides and metatarsal bone of the little toe, from the latter of which it derives additional fibres, to be inserted in the root or proximal extremity of the first or proximal phalanx of the little toe. This abductor, which is intimately connected with the flexor brevis minimi digiti pedis N, inflects the little toe fibulad, or abducts it, and also inflects it plantad.*

The flexor brevis digiti minimi pedis† N, in *Fig.* 1 of Plate XXI., situated in the sole of the foot, on the tibial margin of the abductor digiti minimi pedis, with which it is intimately connected, derives its origin from the os cuboides, the vaginal ligament of the peroneus longus, and the metatarsal bone of the little toe, along which it advances to be inserted in the root or proximal extremity of the first or proximal phalanx of the little toe.‡

abducendo dicatus. Abductor minimi digiti: Minimum abducens Le metatarsien et le grand parathénar L'abducteur du petit orteil. Calcaneo-sous-phalangien du petit orteil Calcaneo-phalangien du petit doigt.

* The abductor digiti minimi pedis is concerned in luxation of the proximal phalanx of the little toe, in amputation of this toe, or of its metatarsal bone, and also across the foot.

† Syn. *Unus ex* musculis primos articulos flectentibus, qui tertium musculum *pedis* in numero succedunt Decem musculos singulis digitis pedis binos inservientes: Parvos musculos, quorum quatuor collocantur in planta Musculus minimum digitum extrorsum inflectens Interosseus Flexor primi ossis minimi digiti. Flexor primi internodii minimi digiti Flexor primi internodii minimi digiti proprius: Petit parthénar Le court fléchisseur du petit orteil: Tarso-sous-phalangien du petit orteil Métatarso-phalangien du petit doigt.

‡ The flexor brevis digiti minimi pedis is concerned in luxation of the proximal phalanx of the little toe, in amputation of this phalanx, and the metatarsal bone of the same toe.

This muscle inflects the proximal phalanx of the little toe plantad.

I shall defer the examination of the plantar interossei until I have described the muscles on the fibular and patellar aspects of the leg and foot, in order that we may investigate the patellar interossei in immediate succession. On the fibular aspect of the leg are situated the two peronei muscles, the longer being superficial to the shorter. They are delineated in *Figs.* 1 of Plates XX. XXI. XXII. and XXIII. of this Part, and in Plate XVIII. of Part III.; the former or longer being marked F, the latter or shorter I.

The peroneus longus muscle* F, in Plate XVIII. of Part III., and in *Figs.* 1 of Plates XX. XXIII. and XXIV. of Part VI., situated on the fibular aspect of the leg, and the plantar of the foot, derives its origin from the upper or proximal third of the fibula, and descends on this bone, soon forming a long tendon, which runs on the popliteal aspect round the malleolus externus, being bound down by the vaginal ligament K; the tendon then runs in a groove of the os cuboides, obliquely across the sole of the foot, to be inserted in the internal cuneiforme bone *d*, and the metatarsal bone 20 of the great toe. On first inspection, this muscle is found covered by the fascia of the leg, from which it derives part of its origin, and so completely surrounds the peroneus brevis I, as to obscure the latter muscle. The tendon running round the malleolus externus, forms a groove in

* Syn. Septimus pedem moventium: Quartus anterioris pedis musculus: Peroneus posticus: Oblique moventium pedem, secundus abducens, peronæus primus, fibulæus: Peronæus primus: Peroneus primus, seu posticus: Le long peronier communément dit péronier postérieur: Le long péronier latéral: Grand péronier: Péronéo-sous-tarsien: Tibi-péronéo-tarsien.

the fibula; and where the tendon runs in the sole of the foot, in the groove of the os cuboides, it is osseous in the adult; and onwards from this to the insertion, the tendon is bound down by the plantar ligaments. The function of this muscle is to extend the ankle-joint or to inflect poplitead the tarsus, and to abduct the foot fibulad.*

* The peroneus longus is concerned in fracture of the tibia and fibula, either singly or conjointly; and such is the power of abduction of this muscle, that it is scarcely practicable to prevent a certain degree of this attitude following a reunion of these bones. It is still more difficult to prevent this position of the foot in luxation of the ankle-joint laterally with fracture of one or both of these bones, a species of accident that frequently occurs. When either of these happens, a great number of leeches, followed by hot anodyne fomentations and poultices, should be used, until inflammation has been subdued; the luxation in the one case being previously reduced, the fractured ends of the bones are then to be put in apposition, and retained by Dupuytren's simple apparatus, which consists of a long softly stuffed cushion, from two to three inches diameter, which is to be doubled, the doubled end being applied to the malleolus internus, and the loose ends to the head of the tibia; the cushion, therefore, extends along the tibial aspect of the leg, and the one fold lies upon the other. Upon this soft cushion, a wooden splint, three inches broad, is to extend from the head of the tibia downwards, or distad, to three inches beyond the sole of the foot. A roller of three inches in breadth is to be applied round the leg at the head of the tibia, for two or three turns to fix the splint and cushion; another roller is next to be applied to the end of the splint which projects beyond the sole of the foot, and when fixed, to be carried over the upper or patellar aspect of the ankle-joint, round by the fibular margin of the sole of the foot, onwards to its tibial aspect, where it is again to be turned round the splint, making the roller cross the latter at its anterior edge, which points to the toes, and run superficially, or, if I may apply the expression, tibiad, and backwards or poplitead, round towards the sole of the foot, where the roller is made again to cross its preceding turn, and brought upwards on the patellar aspect of the ankle-joint, to run the same circuit for several turns;—the chief object being to turn the foot inwards or tibiad, and retain it there, so as to obviate abduction fibulad after the cure. This is the only apparatus with which I have been able to prevent abduction of the foot, and even with it great attention is requisite; the bandage must be carefully watched whenever it becomes slackened, so that it may be renewed.

The peroneus longus, besides luxation laterally, is concerned in all the other kinds of luxation of the ankle-joint, and in amputation of the foot and leg.

The peroneus brevis muscle* l, in *Figs.* 1 of Plates XX. XXI. XXII. XXIII. and XXIV. of Part VI., situated on the fibular aspect of the leg, and concealed for some extent by the peroneus longus z, derives its origin from nearly the whole extent of the fibula l, forming a strong short tendon i, which runs round the malleolus externus &, to be inserted in the root or proximal extremity *t* of the metatarsal bone 5 of the little toe. The tendon of this muscle contributes to form the groove on the popliteal aspect of the malleolus externus, at which place it is bound down by the vaginal ligament x. This tendon is also bound down by another vaginal ligament, immediately before its insertion in the metatarsal bone of the little toe. This muscle extends the ankle-joint, or inflects poplitead the tarsus, and abducts the foot fibularl.†

The vaginal ligament x, of these two peronei muscles,‡ seen in *Figs.* 1 of Plates XX. and XXIII., extends between the malleolus externus and the os calcis; in Plate XX. it is large and untouched, while in Plate XXIII. the ligament is much reduced in breadth and thickness. From this ligament, ligamentous productions descend to the os calcis, between the tendons of the peronei muscles, so as to separate them. The use of this

* Syn. Octavus pedem moventium: Quintus anterioris pedis musculus: Peroneus anticus: Flectentium pedem secundus, peroneus secundus semifibularcus: Peroneus secundus: Peroneus secundus, seu anticus: Le moyen ou petit péronier communément dit péronier antérieur: Moyen péronier: Grand péronéo-sus-métatarsien.

† The peroneus brevis has the same relation to surgery that the peroneus longus has: see page 187.

‡ Syn. Ligamentum tendinum peroneorum: Retinaculum tendinum peroneorum.

ligament is described under the peroneus longus and brevis.*

On the patellar aspect of the leg and foot, the muscles are few and simple, and form the antagonists of those on the popliteal and fibular aspects. When the integuments are removed from the patellar aspect of the leg, the muscles present a uniform surface, being covered and held together by the fascia of the leg, which is a continuation of the fascia lata femoris. We have therefore to dissect them onwards to their tendons on the foot, before we are able to distinguish them. The muscles which then appear are the tibialis anticus A, the extensor proprius pollicis pedis C, and the extensor longus digitorum pedis B, as represented in Plate XVIII. of Part III.; the extensor longus digitorum and the tibialis anticus being united at their surface or dermal aspect by the fascia, so as to conceal the extensor pollicis.

The extensor longus digitorum pedis† B, in Plate XVIII. of Part III., situated on the patellar aspect of the leg and foot, derives its origin from the two upper or proximal thirds of the fibula, and forms a flat tendon, which, running under the annular ligament D, splits into four or five tendons, which proceed onwards, to be inserted

* This ligament is occasionally lacerated in sprains, and also in luxation of the ankle-joint. When the former occurs, a number of leeches should be applied, and followed by hot anodyne fomentations and poultices, until the inflammatory action is subdued, and the limb bandaged with a roller, carried from the toes upwards above the ankle-joint, with strict rest enjoined for five or six weeks, when passive motion should be employed. If much swelling is present, frictions, with stimulating medicines, may be employed along with the bandage.

† Syn. Decimus quartus pedis digitos moventium Secundus musculus anterioris pedis. Longus digitûm tensor, sive enumodactylicus. Digitorum tertium internodium extendens Extensor longus Le long extenseur commun des orteils Grand extenseur Péronéo-sus-phalangettien commun Péronéo-tibi-sus-phalangettien commun.

in the phalanges of the four lesser toes. I have already mentioned, that the muscle is intimately connected with the tibialis anticus A, more or less with the extensor proprius pollicis C, and also with the peroneus longus F. The dissector should therefore trace the muscle from the conjoined tendon, immediately proximad to the annular ligament D, upwards, cutting through the fascia of the leg which binds it to the tibialis anticus, but leaving the fascia that connects this muscle with the peroneus longus sound, as the two latter cannot be separated without injury. When the tendon divides into five portions, the fifth is inserted in the metatarsal bone of the little toe, and is named peroneus tertius;* but as this tendinous slip is sometimes deficient, and as it cannot be separated from the general tendon and muscle without injury, I have followed Cowper, and some other anatomists, in considering it a portion of the flexor longus digitorum. Where the four tendinous slips arrive at the proximal phalanges of the four lesser toes, they expand, forming a tendinous layer, which covers all the three phalanges. The function of this muscle is to bend the ankle-joint or to inflect patellad or rotulad the tarsus, and to extend the three phalanges of the four lesser toes, as well as abduct the foot and toes fibulad.†

* Syn. Nonus pedem moventium: Musculus pedis qui tertius decimus annumeratur: Pars extensoris digitorum pedis longi: Quintus tendo-extensoris longi digitorum pedis: Petit péronier: Court péronier: Petit péronéo-sus-métatarsien.

† The extensor longus digitorum pedis is concerned in luxation of the ankle-joint, and in that of the four lesser toes; in fracture of the fibula and tibia; in amputation of the four lesser toes, and extirpation of either of the metatarsal bones of these toes; and in amputation across the foot, and in that of the leg. This muscle from its power of abducting the foot, assists the peroneus longus in distorting the limb, after luxation of the ankle-joint accompanied with fracture of the tibia and

The extensor brevis digitorum pedis* E, in Plate XVIII. of Part III., situated on the upper or patellar aspect of the foot, derives its origin from the same aspect of the os calcis, runs along the other tarsal bones, dividing into four fleshy slips, which soon become tendinous, and are inserted in the tendinous expansions of the extensor longus digitorum B, excepting the one to the little toe. The fourth and larger portion of the muscle is therefore inserted in the tendinous expanse of the extensor proprius pollicis C. The use of this muscle is to assist the extensor longus in extending the phalanges of the three toes next the great toe, and also to assist the extensor proprius pollicis in extending the two phalanges of the great toe.†

The tendons of the extensor longus and brevis have delicate ligamentous threads‡ running transversely over them, where they extend along the first or proximal joints of the toes.

The extensor proprius pollicis pedis§ C, in Plate XVIII. of Part III., situated on the patellar aspect of the

fibula, either singly or conjointly, and also in simple fracture of these bones; see page 187. This muscle also relates to the securing of the anterior tibial artery, as described in page 116 of Part III.

* Syn. Decimus sextus pedis digitos moventium. Postremus musculus pedis Brevis digitùm tensor, sive pedeus. Extendens digitorum secundum articulum: Extensor pollicis brevis, una cum extensore digitorum brevi Extensor brevis una cum extensore brevi. Extensor digitorum brevis: Le court extenseur commun des orteils. Extensor brevis digitorum pedis, una cum extensore proprio hallucis. Le pedieux Petit extenseur des orteils. Calcaneo-sus-phalangettien commun.

† The extensor brevis digitorum pedis is concerned in luxation of the joints of the great toe, and the three contiguous toes; also in amputation of these, of the metatarsal bones, and across the foot.

‡ Syn. Retinacula lata extensorum.

§ Syn. Decimus quintus pedis digitos moventium · Tertius musculus anterioris pedis Extensor pollicis Pollicis tensor Extensor pollicis longus Extensor longus · Grand extenseur du pouce du pied. Extensor proprius hallucis · Péronéo-sus-phalangettien du pouce. Péronéo-sus-phalanginien du pouce.

leg and foot, and concealed in the leg by the extensor longus digitorum pedis B and the tibialis anticus A, derives its origin from the medial third of the fibula and interosseous ligament, and descends between the aforementioned muscles to the annular ligament D, where it becomes tendinous, and beneath or centrad to the ligament, advancing along the tarsus and the metatarsal bone of the great toe, to be inserted by a tendinous expansion in the two phalanges of the great toe. The function of this muscle is to extend the two phalanges of the great toe, and to bend the ankle-joint or to inflect patellad the tarsus.*

The fascia of the leg binds down the tendon of the extensor proprius pollicis, and adheres to the tarsal and metatarsal bones, so as to form an individual sheath† to the tendon. This is in many places stronger than in others.

The tibialis anticus muscle‡ A, in Plate XVIII. of Part III., situated on the patellar aspect of the leg and foot, derives its origin from the two proximal thirds of the tibia, from the fascia of the leg, and from the interosseous ligament, and descends forming a strong tendon which runs under or centrad to the annular ligament D onwards to the os cuneiforme internum of the tarsus, and metatarsal bone of the great toe. This muscle, as previously described, adheres intimately to the extensor lon-

* The extensor proprius pollicis pedis relates to the securing of the anterior tibial artery, as detailed in page 116 of Part III., is concerned in luxation of the ankle-joint, and of the two phalanges of the great toe; and also in amputations of the two latter, across the foot, and of the leg.

† Syn. Ligamentum proprium tendinis extensoris proprii longi pollicis.

‡ Syn. Sextus pedem moventium Primus musculus anterioris pedis Tibialis anticus Flectentium pedem primus, tibiæus anticus, externus musculus Le muscle antérieur Tibio-sus-tarsien Tibio-sus-métatarsien.

gus digitorum, by means of the fascia of the leg. Its function is to bend the ankle-joint, or to inflect patellad the tarsus.*

The annular ligament of the tarsus n,† is merely that part of the fascia of the leg rendered thicker, where it crosses the articulation by frequent motion, and hence must not be expected to be found so distinct in dissection, being connected both above and below, or proximad and distad, with the general fascia of the leg.‡ This ligament extends between the malleolus internus s, and the os calcis, and binds down the extensor tendons of the toes, together with that of the tibialis anticus.

Before proceeding with the ligaments of the ankle-joint, I shall finish the description of the remaining muscles, which are only the interossei, although I should recommend to the student, to investigate the joints immediately after the examination of the muscles which run over them.

The interossei of the foot resemble those of the hand, and consist of two series, the one being situated on the patellar aspect of the foot, and named interossei digitorum externi pedis, the other series being situated on the plantar aspect of the foot, and styled interossei digitorum interni pedis.

The interossei digitorum externi pedis,§ G, D, K, L, in

* The tibialis anticus muscle relates to the securing of the anterior tibial artery, as described in Part III., page 116; is concerned in luxation of the ankle-joint; and in amputation across the foot, and of the leg.

† Syn. Retinacula lata extensorum Ligamentum vaginale tibiæ.

‡ The annular ligament is concerned in sprains of the extensor tendons, and in luxation of the ankle-joint. For the treatment of the former, see page 189.

§ Syn. Musculos primos articulos flectentes, qui tertium musculum in numero succedunt · Decem musculos singulis digitis pedum binos inservientes. Parvi musculi quorum quatuor collocantur inter medios ossa pedii. Interossei externi.

Fig. 1 of Plate XXIV., situated between the metatarsal bones 20, 2, 3, 4, 5, are four in number, arising by double origins from each two contiguous metatarsal bones, and inserted into the proximal phalanges.

The first is named abductor indicis pedis, but more correctly adductor, indicated by G, in *Fig.* 1 of Plate XXIV., deriving its origin from the os cuneiforme internum *d*, and the two metatarsal bones 20, 2, of the great toe and index, and running along the tibial aspect of the index or second toe 2, to be inserted in the same aspect of the root or proximal extremity of the proximal or first phalanx, and the expansive tendon of the extensor longus. The function of this muscle is to adduct or to inflect tibiad the index pedis, and to bend or inflect plantad the proximal phalanx of this toe.*

The adductor, but properly abductor indicis pedis D, in *Fig.* 1 of Plate XXIV., derives its origin from the metatarsal bones 2 and 3 of the index and medius toe, and runs along the fibular aspect of the index 2, to be inserted in the same aspect of the root or proximal extremity of the first or proximal phalanx of this toe, and the expansive tendon of the extensor longus. Its function is to abduct or inflect fibulad this toe, and to bend or inflect plantad the proximal phalanx.†

The adductor medii digiti pedis, but more strictly speaking, the abductor K, in *Fig.* 1 of Plate XXIV., de-

Interossei pedis: Interosseux superieurs du pied: Metatarso-phalangiens lateraux: Sus-metatarso-lateri-phalangiens.

* The abductor indicis pedis is concerned in luxation and amputation of the proximal phalanx, and in extirpation of the metatarsal bone of both this toe and the index toe.

† The adductor indicis pedis is concerned in luxation and amputation of the proximal phalanx of the index toe, and in extirpation of the metatarsal bone of both this and the middle toe.

rives its origin from the metatarsal bones 3, 4, of the medius and annularis toes, and extends along the fibular aspect of the middle toe 3, to be inserted in the same aspect of the root or proximal phalanx of the middle toe, and the expansive tendon of the extensor longus. Its function is to abduct or inflect fibulad this toe, and to bend or inflect plantad the proximal phalanx.*

The adductor tertii digiti pedis L, in *Fig.* 1 of Plate XXIV., but properly the abductor, arises from the metatarsal bones 4, 5, of the ring and little toes, and runs along the fibular aspect of the annularis 4, to be inserted in the same aspect of the root, or proximal extremity of the first or proximal phalanx,† and the expansive tendon of the extensor longus. Its function is to abduct or inflect fibulad this toe, and to bend or inflect plantad the proximal phalanx.

The interossei digitorum interni pedis,‡ represented in Plate XXIII., are said to be only three in number; but this varies like the palmar interossei of the hand. The interossei described by authors are an abductor medii digiti pedis M, an abductor tertii digiti pedis P, and an abductor minimi digiti pedis Q. In this subject, however, we have an abductor T, and an adductor indicis A, an adductor medii digiti pedis *g*, and an adductor

* The adductor medii digiti pedis is concerned in luxation and amputation of the proximal phalanx of the middle toe, and the metatarsal bone both of this and the ring toe.

† The adductor tertii digiti pedis is concerned in luxation and amputation of the proximal phalanx of the third or ring toe, and the metatarsal bone both of this and the little toe.

‡ Syn. Musculos primos articulos flectentes, qui tertium in numero succedunt: Decem musculos singulis digitis pedis binos inservientes Parvos musculos quorum quatuor collocantur in planta Sunt interossei interni Interossei Interossei pedis Inter-osseux inferieurs du pied. Inter-osseux plantaires Métatarso-phalangiens lateraux. Sus-métatarso-lateri phalangiens.

tertii digiti pedis *t*, which are very common. I have adhered to these names to prevent confusion, although they should be reversed; for the abductors are adductors, and the adductors abductors. These little muscles are very difficult to separate and distinguish, even according to the number described by authors; indeed they are more difficult to be understood in this way, than when an adductor and an abductor are assigned to each toe. They derive their origins from the sides of the metatarsal bones, and are inserted in the proximal phalanges of the same toes.

The abductor digiti medii pedis muscle M,* Plate XXIII., properly speaking the adductor medii digiti, arises from the tibial aspect of the metatarsal bone of the middle toe, along which it runs, to be inserted in the same aspect of the root or proximal extremity of the proximal phalanx of the same toe. Its function is to adduct the middle toe tibiad, and to inflect plantad the proximal phalanx.†

The abductor tertii digiti vel annularis pedis, more properly adductor P,‡ in Plate XXIII., and *Fig.* 1 of Plate XXII., derives its origin from the tibial aspect of the metatarsal bone of the ring-toe, along which it advances, to be inserted in the same aspect of the root, or proximal extremity of the same toe. The function of this muscle is to adduct tibiad the ring or third toe, and to inflect plantad the proximal phalanx.§

* Syn. Abductor digiti tertii pedis.

† The abductor digiti medii pedis is concerned in luxation and amputation of the proximal phalanx, and in extirpation of the metatarsal bone of the middle toe.

‡ Syn. Abductor digiti quarti pedis.

§ The abductor tertii digiti pedis is concerned in luxation and amputation of the proximal phalanx, and in extirpation of the metatarsal bone of the third or ring-toe.

The abductor digiti minimi pedis* g, Plate XXIII., and in *Fig.* 1 of Plate XXII., strictly speaking adductor, derives its origin from the tibial aspect of the metatarsal bone of the little toe, along which it proceeds, to be inserted in the same aspect of the root, or proximal extremity of the phalanx of the same toe. Its function is to adduct tibiad the little toe, and to inflect plantad the proximal phalanx.†

I now proceed to the ligaments of the leg and foot.

The tibia and fibula are tied together by several ligaments, of which the interosseous‡ is the larger. This ligament is represented in Plate XXIII., and in *Figs.* 1 of Plates XXIV. XXII. and XXI., marked H, extending between the tibia *o* and the fibula l, the fibres descending obliquely from the tibia to the fibula. At its proximal or upper portion, the anterior tibial blood-vessels run through an aperture from the popliteal to the patellar aspect, as represented in *Fig.* 1 of Plate XX., but not in XXIII., as the muscles on the patellar aspect had not been removed from the extremity when the drawing was taken; this portion of the ligament, however, is observed to be more delicate. There are also found several smaller holes for the passage of blood-vessels. The use of this ligament is to connect the fibula to the tibia, and to afford origin to several muscles of the leg.§

* Syn. Adductor digiti minimi pedis.

† The abductor digiti minimi pedis is concerned in luxation and amputation of the proximal phalanx, and in extirpation of the metatarsal bone of the little toe.

‡ Syn. Membrana cruris interossea.

§ The interosseous ligament is concerned in fracture of the tibia or fibula, either singly or conjointly, and in amputation of the leg. When the latter operation is deemed requisite, the insertion of the inner hamstring muscles should be considered as regards the preservation of the motion of the knee-joint; and the extent of the fleshy fibres of the gastrocnemii muscles, as relates to their forming a proper cushion for the bones. The patient ought to be placed on a low table covered with a mattress.

The proximal and distal extremities of the fibula are firmly connected with the tibia by a capsular and intertransverse ligaments. The superior or proximal extremity 60 of the fibula 1, is attached to the tibia by strong intertransverse ligaments, marked 5, in Plate XXIII., which extend between the head of the tibia and that of the fibula; similar ligamentous fibres being found on the patellar aspect. This extremity or head of the fibula is covered with cartilage where it looks to the tibia, and both surfaces are surrounded with a capsular ligament.*

with his leg projecting beyond its edge, and supported by an assistant; and the tourniquet applied about the middle of the thigh, as directed in page 57 of Part V., and page 150 of this Part. An assistant holding the limb firmly above the knee, the operator takes hold of the foot with his left hand, raises the limb as high as the patient can bear, and with a large scalpel makes a semicircular incision on the popliteal aspect of the leg from the fibula to the tibia if the left leg, and vicê versâ if the right leg; the arc of the circle pointing distad, and the cord extending across the leg. The first incision ought to extend through the skin, cellular substance, and the bellies of the gastrocnemii, and the second through the more deeply seated muscles to the bone. The operator next makes a transverse or semi-elliptical incision on the patellar aspect of the leg, so as to connect the two ends of the popliteal incision, through the skin, cellular substance, and muscles on the patellar aspect; and then passes the knife between the tibia and fibula, so as to divide any remaining fleshy fibres, and to separate the interosseous ligament. A linen or leather retractor is then drawn through between the bones, and with this the assistant retracts the soft parts, when the operator saws through the bones as directed in page 58 of Part V., resting the instrument on both bones, but dividing the fibula before the tibia. The limb being thus removed, the operator searches for the arteries; and at this stage of the amputation, the knowledge of the surgeon is at once recognised. If the limb be removed near the ropples, only one artery, the popliteal, will require to be secured, the gastrocnemii branches being easily stemmed by compression; if a little distad, the three arteries of the leg will require to be secured. See Part III., Plate XX. For ligatures and after treatment, see Part V., page 58.

* Syn. Ligamentum capituli fibulæ: Ligamentum capsulare extremitatis superioris.

This joint is sometimes luxated, the head of the fibula being forced poplitead. It is easily brought to its situation, but is as easily displaced again. A roller

The inferior or distal extremity of the fibula 1, is firmly tied to the tibia by intertransverse ligaments,* marked 70, in *Figs.* 1, 2, and 3, of Plate XXIV., which extend from the distal extremity of the tibia *o*, to that of the fibula 1, both on the patellar and popliteal aspects. Similar strong ligamentous bands extend between the ends of these bones, where they are opposed to each other, so as to render their connexion extremely strong and firm.†

The ankle-joint is formed by the tibia, fibula, and astragalus, surrounded by a capsular ligament, and supported by strong lateral ligaments. The articular surface of each of these bones is tipped with cartilage, and there are several glandular tissues to secrete the synovial fluid, particularly one between the tibia and fibula, marked 10 in *Fig.* 3 of Plate XXIV., and also in *Fig.* 2 of Plate XXI.

The capsular ligament delineated in *Figs.* 1, 2, and 3, of Plate XXIV., and in *Fig.* 2 of Plate XXI., marked with the digits 30, surrounds the articular surfaces of the tibia, fibula, and astragalus, which enter into the formation of the ankle-joint. This ligament is remarkably thin, abounds with adipose substance, and is with difficulty preserved in dissection. Exterior to the capsular, are the lateral ligaments which are common to all the ginglymoid joints; the tibial or internal of this joint is single, while the fibular or external consists of three portions.

should be applied tightly around the limb at this part, with a pad popliteal to the head of the fibula; and if much synovia is effused, blistering may be had recourse to.

* Syn. Ligamentum superius anticum et posticum partis inferioris cruris Ligamentum inferius anticum et posticum partis inferioris cruris Ligamentum extremitatis inferiorus.

† These intertransverse ligaments are seldom torn, and only in luxation of the ankle-joint.

The tibial or internal lateral ligament, named also deltoid,* 33, extends between the malleolus internus *s*, the os astragalus *a*, and os naviculare *b*, as delineated in *Fig.* 2 of Plate XXII., and *Figs.* 1 and 2 of Plate XXIV., and, as its name indicates, commences by a narrow beginning or apex, from the tibia *s*, radiating to the astragalus *a*, and naviculare *b*. This ligament is remarkably strong, and binds these bones together.

The fibular or external lateral ligament consists of three portions; an anterior, a middle, and a posterior. The anterior or patellar portion,† marked 31, in *Fig.* 1 of Plate XXIV., extends between the malleolus externus S, and the astragalus. The middle, or perpendicular portion‡ 32, descends from the malleolus externus S, to be attached to the os calcis D, as delineated in *Fig.* 2 of Plate XXIV., also in *Figs.* 1 and 3 of the same Plate. The posterior or popliteal portion§ 14, in *Fig.* 2 of Plate XXIV., is generally included within the capsular ligament 30, and extends from the malleolus externus S, to the popliteal aspect of the astragalus *a*. This external lateral ligament contributes in a powerful manner to connect the bones of the tarsus with those of the leg.‖

* Syn. Ligamentum deltoides malleoli interni.

† Syn. Ligamentum fibulæ anticum vel anterius.

‡ Syn. Ligamentum fibula medium: Ligamentum malleoli externi medium perpendiculare.

§ Syn. Ligamentum fibulæ posticum: Ligamentum fibulæ posterius.

‖ The ankle-joint is liable to be dislocated in every direction, either laterally, or forwards, or backwards; dislocation to the inner or tibial side being the most frequent. In this latter accident, the capsular ligament is lacerated, excepting where it is attached to the fibula, which bone is generally fractured an inch or two above or proximad, and thus the fibular lateral ligaments remain entire; the tibia is also usually fractured near the malleolus internus, and separated from the fibula by a rupture of the intertransverse ligaments, so that the deltoid or tibial lateral ligament may likewise remain sound. This portion of the tibia rests upon the

The tarsal ligaments are divided into capsular and transverse; the latter into transverse and peculiar plantar

tibial side of the astragalus, while the proximal fractured end of the fibula rests on the upper or proximal articulatory surface of the astragalus. The accident is easily distinguished, unless much tumefaction has supervened. Reduction is easily accomplished by laying the patient in bed on the injured side, relaxing the gastrocnemius muscle by bending the knee-joint, and then extending the foot gently and gradually, resistance being made either by the surgeon putting his knee against the thigh of the patient close to the knee-joint, or by an assistant grasping the thigh above the knee. When reduced, the limb is to be laid on its fibular aspect on a pillow, and a great number of leeches applied, followed by hot anodyne fomentations and poultices, till all inflammatory action is subdued. Dupuytren's apparatus, as described in page 186, will be found the best to keep the parts in apposition, and prevent abduction of the foot afterwards.

In luxation outwards or fibulad, both the malleoli are generally fractured, so as to preserve the lateral ligaments, the proximal part of the trochlear surface of the tibia is thrown somewhat fibulad on the superior or proximal surface of the astragalus, so that the sole of the foot is turned inwards or tibiad, with the fibular margin of the foot resting on the ground. The capsular ligament is more or less lacerated. If the fibula be not fractured, the fibular lateral ligaments are torn. The same mode of reduction and treatment as in the former is here employed.

In luxation forwards or distad, the tibia is either forced a little from its natural situation, so as still to rest upon the os astragalus, or it is driven forwards upon the os naviculare and os cuneiforme internum; the fibula is generally fractured two or three inches above its malleolus, which remains in situation from the strength of the fibular lateral ligaments, while the shaft of the fibula accompanies the tibia, the capsular and deltoid ligaments being more or less lacerated. The position of the foot in the latter of these two accidents is—the heel lengthened and dragged a little popliteal, and the toes pointed downwards, so as to give the foot a shortened appearance; while a large projection is perceived on the upper part of the foot, and a depression between the tibia and tendo achillis. In the former of these two accidents there is much less disfiguration of the foot, the accident being liable to be mistaken for a sprain or contusion. The same manner of reduction and treatment is requisite, as in luxation inwards; see page 200. Sometimes the trochlear surface of the tibia is fractured.

In either of the preceding luxations, if reduction cannot be accomplished by the means recommended, the patient should be bled to fainting, and the same repeated.

In compound luxation of the ankle-joint, amputation becomes a matter of consideration, according as there is more or less injury done both to the hard and soft

ligaments. As the transverse lie superficial to the capsular, they should be first examined. In *Fig.* 1 of Plate XXIV. are represented the patellar or dorsal transverse ligaments,* marked z, which are observed to extend from one tarsal bone to another, so as to connect them together. In *Fig.* 2 of Plate XXI., one of these z, extending between the os

parts, and according as the patient can be well accommodated and remain quiet. If an attempt be made to save the limb, as many pieces of bone should be removed as can be done with facility and promptitude, and the luxation reduced, dividing any portion of skin which may prevent its accomplishment; the limb is then to be laid in an easy attitude on a soft pillow, with the knee bent, the lips of the wound brought together by adhesive straps and suture, as may be found requisite, and the wound covered with dry lint, to shut out the external air. A number of leeches should then be applied to the contiguous surface of the wound, which are to be followed by hot anodyne fomentations and poultices, till the inflammation be subdued. If inflammatory fever threaten, general blood-letting should be boldly had recourse to, and in this, as in similar cases, carried to syncope, and the leeches to the contiguity of the wound frequently repeated; for on the prompt reduction of inflammation depends the moderation of suppuration. When the inflammation has ceased and suppuration been established, the wound is to be treated with simple dressing, and the application of a many or nine-tailed bandage, not stitched together, in order that any piece of it may be removed when soiled, and the limb laid on its fibular side on a hollow splint having a foot-piece at right angles, if the luxation be inwards or tibiad. In luxation outwards or fibulad, a similar hollow splint, having an aperture opposite the wound, is to be applied on each side of the leg, which is to be placed in the common fracture-box or double inclined plane, so that the limb may rest on the heel. Several months generally pass over before the patient can put his foot to the ground, even with the assistance of crutches.

The protruded portion of bone, when so obliquely fractured that it cannot rest upon the astragalus, or when it cannot be easily reduced, has been recommended to be sawn off, which has generally succeeded in moderating the inflammation, and forming a tolerable joint. For a most interesting account of important cases of compound luxation of the ankle-joint saved, the reader is referred to Sir Astley Cooper's work on Dislocations and Fractures; and for other information, to Petit, Traité des Maladies Chirurgicales, tome 3; to Desault's Chirurgical Works, by Bichat, vol. 1; to Pott on Fractures and Dislocations; to Boyer, Traité des Maladies Chirurgicales, tome 4; and to Dupuytren Annuaire Medico-Chir. des Hopitaux de Paris, 1819.

* Syn. Ligamenta pedis dorsalia; Ligamenta transversa dorsi pedis.

calcis *r*, and the os cuboides *g*, is represented truncated. In this figure, another intertransverse ligament,* marked *u*, is observed extending between the os astragalus *m*, *a*, and the junction of the os naviculare *b* with the os cuboides *g*, to connect these bones more securely. Similar ligaments are found between all the tarsal bones, extending between the scabrous surfaces opposed to each other.†

On the plantar aspect, the two ligaments, commonly named plantar, present themselves, and are delineated in *Figs.* 1 and 2 of Plates XXII. and XXIII., marked *w*, *y*; the latter, *y*, is named the external or fibular plantar ligament, from its situation on the outer or fibular aspect of the sole of the foot, is remarkably strong and conspicuous, and extends from near the projection of the os calcis D, onwards or distad to the os cuboides *g*, and external cuneiform bone. This ligament assists in supporting the arch of the foot.‡

The internal or tibial plantar ligament *w*, in *Figs.* 1 and 2 of Plates XXII. and XXIII., situated in the sole of the foot, on its internal or tibial aspect, is equally powerful with the preceding, and extends between the sinuosity of the os calcis D, and the os naviculare *b*, thus supporting the os astragalus *a*, and contributing to form the arch of the foot. This ligament is more or less incorporated with the deltoid ligament 33, of the ankle-joint, as represented in *Fig.* 2 of Plate XXII.§

Besides these two conspicuous plantar ligaments, much

* Syn. Ligamenta lateralia.

† These ligaments are concerned in luxation or extirpation of any of the tarsal bones, and also in amputation across the foot.

‡ The fibular plantar ligament is concerned in extirpation of the os cuboides, and in amputation across the foot.

§ The tibial plantar ligament is concerned in luxation and extirpation of the os naviculare, and also in amputation across the sole of the foot.

smaller ligaments are found extending between the different tarsal bones, as represented in *Fig.* 1 of Plates XXII. and XXIII., marked *x.* *

When the transverse ligaments are carefully removed or divided across, a capsular ligament is found surrounding those articular surfaces, which are opposed to one another, as delineated in *Figs.* 2 and 3 of Plate XXI. In *Fig.* 2 the articulation between the convex surface *m* of the os astragalus and the concave surface *b* of the os naviculare is observed surrounded with the capsular ligament *v*; and the articulation between the conchoidal surfaces of the os calcis *t*, and the os cuboides *g*, is also surrounded with a capsular ligament *e*. These capsular ligaments are very delicate, and seem designed chiefly to confine the synovial fluid.†

* These plantar ligaments are concerned in luxation and extirpation of the tarsal bones, to which they are attached, and in amputation across the foot.

† These capsular ligaments are concerned in amputation across the foot, at these two articulations, which preserves to the individual the extension of the ankle-joint, and the propulsion of the body forwards; so that it is a great improvement in surgery, when the distal tarsal and metatarsal bones, and phalanges of the toes, are so injured or diseased as to require removal. As we have more marked guides on the fibular than on the tibial aspect of the foot, we ascertain the articulation between the os calcis and os cuboides, by dividing the space between the projection at the root or proximal extremity of the metatarsal bone of the little toe marked *t* in *Fig.* 9 of Plate VIII. of Part I., and the fibular extremity of the projection of the os calcis *c* in the same Plate, or simply the heel, into four proportional parts, of which one from the metatarsal bone, and three from the heel, will indicate the articulation. This being kept in view, and the tourniquet applied, as directed in page 150 of Part VI., and in page 57 of Part V., the operator makes a semicircular incision on the patellar aspect of the foot, a little distad from this articulation, and extending from this fibular to the tibial aspect, the arch of the semicircle pointing downwards or distad (the incision should be carried as deep as possible, to divide skin and tendons at once); the operator next inserts his scalpel between the os cuboides *g*, and the os calcis *t*, carrying it transversely across between the os astragalus *m*, and the os naviculare *b*, as represented in *Fig.* 2 of Plate XXI., dividing the transverse *x*, *u*, and capsular ligaments *e*, *v*.

In *Fig.* 3 of Plate XXI., the articulation formed by the os naviculare *b*, and the three cuneiform bones *d*, *e*, *f*, is drawn enveloped in one capsular ligament *v*. This

These transverse articulations being thus dislocated or separated, the operator carries the knife immediately beneath or plantad to the os naviculare and os cuboides, cutting distad for a sufficient length, to form a cushion for the stump, the bony portion of which consists of the os astragalus and os calcis; which plantar incision should be of a semicircular figure, to correspond with the patellar flap, and the operator should make it as large as the breadth of the sole of the foot will admit, as the flap is thick and unyielding. The arteries are next secured, (See Plate XX. of Part III.,) and the lips of the wound approximated and retained by suture and adhesive straps, with lint, malta cross, and bandage, as described in page 58 of Part V., to which the reader is also referred for the after treatment. In performing this operation, the surgeon should depress plantad the distal tarsal and metatarsal bones, so as to open the articulations.

These transverse and capsular ligaments are also concerned in luxation and extirpation of either of these tarsal bones, for which see page 99 of Part I. In luxation of the astragalus, the bone is forced forwards and inwards, or patellad and tibiad; and also forwards and outwards, or patellad and fibulad; and in either of these two varieties, the tibia or fibula is generally fractured. Reduction in both of these cases is usually very difficult, from the tibia and fibula so approximating as to shut out the astragalus, and also from the skin puckering, and the tendons being on the stretch. Bleeding should be performed and carried to syncope, and reduction attempted, the limb being placed in the same attitude as in luxation of the ankle-joint, and, if found impracticable, the astragalus extirpated. But this has been found, even by Dupuytren, excessively difficult. Some surgeons, therefore, never attempt extirpation, after failing to reduce it, but leave all to nature: the skin and ligaments slough, and the bone is detached. That dexterous surgeon Mr. Green, of St. Thomas' Hospital, was successful in extirpating this bone. Attention must be paid to the fractured bone after the reduction.

In some cases, the connexion of the os astragalus with the tibia and fibula remains entire, while that with the os naviculare and os calcis is lacerated, forming a luxation of the os astragalus from these two bones, which takes place either tibiad or fibulad, and is much more easily reduced by the same means, than the simple luxation of the os astragalus before described. In luxation of the os naviculare and os cuboides from the os astragalus and os calcis, which takes place generally inwards or tibiad, the foot resembles the club-foot, and is easily reduced.—For further information on this subject, consult Desault, Hey, Boyer, Dupuytren, and Sir Astley Cooper.

ligament connects these bones, but chiefly confines the synovial fluid.*

In *Fig.* 1 of Plate XXIV., the transverse ligaments on the patellar aspect of the foot, connecting the tarsal with the metatarsal bones, are delineated and marked *p*, and are observed to extend between the three cuneiform bones, the os cuboides, and the five metatarsal bones. In *Fig.* 3 of Plate XXI. are delineated the delicate capsular ligaments surrounding these articulations, marked *l*, and also the intertransverse ligaments i, which extend between these bones within the articulations. These transverse, capsular, and intertransverse ligaments connect these bones together, the capsular also confining the synovial fluid.†

* This capsular ligament is concerned in luxation and extirpation of either of these bones, for which see page 99 of Part I.

† From the manner in which these metatarsal are locked into the tarsal bones assisted by these transverse and intertransverse ligaments, they are seldom or ever luxated. Amputation is performed across the foot by cutting between these bones, when the metatarsal and phalanges are injured or diseased. The form of the flaps is the same as that recommended between the os astragalus and os calcis, and the os naviculare and os cuboides, and the operator also commences on the fibular aspect, carrying the knife tibiad. He easily feels the prominence *t* of the metatarsal bone of the little toe, and after the patellar incision is accomplished, inserts the scalpel between this bone and the os cuboides, dividing across till the knife strikes the os cuneiforme externum *f*, when he carries it a trifle distad between the metatarsal bone 4 of the ring toe, and this bone, till he can notch the instrument in the articulation between this latter bone *f*, and the metatarsal bone 3 of the middle toe, again cutting tibiad till the knife strikes against the os cuneiforme internum *d*, when the operator a second time carries the knife distad between this bone *d*, and the metatarsal bone 2 of the index pedis, till it can be notched between the internal cuneiform bone *d*, and the metatarsal bone 20 of the great toe. The same successive steps are pursued, as in the other amputation across the foot; see page 204. Sometimes there is a little retrogression of the metatarsal bone 2 of the index pedis, on which the knife strikes, but this is easily overcome. In performing this operation, the surgeon should depress plantad the metatarsal bones, so as to open the articulations. It is sometimes requisite to extirpate one of the metatarsal bones, in doing which, attention to its connexions is chiefly required.

The heads or distal extremities of the metatarsal bones 20, 2, 3, 4, 5, are articulated to the proximal extremities of the proximal or first phalanges 6, 8, 11, 14, 17, by capsular and lateral ligaments, the former being marked m, and the latter n, in *Fig.* 1 of Plates XXIV. and XXIII., and in *Fig.* 3 of Plate XXI. The lateral ligaments n, are situated on the tibial and fibular aspects of the joints, extending between the distal extremities or heads of the metatarsal bones, and the proximal extremities of the phalanges. Their use is to connect these bones, and to limit the motions of the joints.

The capsular ligaments marked with the letters m, surround the articulations, connect these bones together, and confine the synovial fluid.*

The heads of the metatarsal bones are tied to each other in the plantar aspect by short transverse ligaments, which are represented in *Fig.* 1 of Plate XXII., marked e.

The distal extremities or heads of the proximal phalanx 8, 11, 14, 17, are connected with the proximal extremities or bones of the second or medial phalanx 9, 12, 15, 18, as represented in *Fig.* 1 of Plates XXIV. and XXIII., by capsular p, and lateral q ligaments,

* These ligaments are concerned in luxation of these joints, which very seldom occure; occasionally the proximal phalanx is forced patellad of the heads of the metatarsal bones, and is easily reduced. The same remark is applicable to the distal joints of the toes, because they are constructed in a similar manner. When amputation is deemed requisite at any of the joints of the toes, it should be performed with two semi-elliptical incisions, their extremes meeting patellad and plantad, and their convexities pointing distad. Each incision should extend as deep as possible at once, and the operator ought to divide, in his third sweep with the knife, one of the lateral ligaments, when the joint is luxated. The scalpel can now be easily carried round the proximal extremity of the bone not to be removed, dividing tendons and capsular ligament, and the other lateral ligament with one or two sweeps. The lips of the wound can be neatly approximated, and kept together by adhesive plaster, a little lint, and a bandage rolled round the toe.

which so resemble those at the proximal extremities or bases of the first phalanx, that they need not be described. The same arrangement of ligaments connect the medial 9, 12, 15, 18, and distal 10, 13, 16, 19 phalanges, and also the proximal 6, and distal 7, of the great toe.

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART VI.

THE MUSCLES AND JOINTS OF THE LOWER EXTREMITY.

PLATE XV.

F, The gluteus maximus muscle
I, The gluteus medius muscle
K, The tensor vaginæ femoris muscle
k, The fascia lata
ſ, The superior posterior spinous process of the os ilium

PLATE XVI.

A, Pyriformis muscle
C, Gluteus minimus muscle
D, Obturator externus muscle
F, Origin of gluteus maximus muscle
G, Adductor magnus muscle
H, Long sacro-ischiadic ligament
I, Origin of gluteus medius muscle
K, Pubic to the gluteus medius muscle I, indicates the tensor vaginæ femoris muscle, which is entire, and on the stretch

PLATE XVI. (*Continued.*)

K, Contiguous to z between it and e, indicates quadratus femoris muscle, which is cut across
L, Long head of biceps flexor cruris muscle
M, Semi-tendinosus muscle
x, Obturator internus muscle
z, Tuberosity of os ischium

e, Trochanter major
f, Fleshy insertion of gluteus maximus muscle
i, Insertion of gluteus medius muscle

k, Fascia lata
s, Levator ani muscle
x, Gemellus superior muscle

c, Branch of gluteal artery
f, Bursa mucosa of gluteus maximus muscle
f, Posterior superior spinous process of os ilium.
x, Gemellus inferior muscle

t, Point of insertion of gluteus medius muscle

20, Great sacro-ischiadic nerve

PLATE XVII. *Fig.* 1.

A, Contiguous to *g*, indicates pyriformis muscle emerging at greater sacro-ischiadic notch
A, Contiguous to *a*, capsular ligament of hip-joint
C, Anterior superior spinous process of os ilium
H, Long sacro-ischiadic ligament
I, Surface of origin of gluteus medius muscle
X, Origin and insertion of obturator internus muscle
Z, Tuberosity of os ilium

c, Insertion of gluteus minimus muscle
h, Short sacro-ischiadic ligament
i, Insertion of gluteus medius muscle
x, Origin of gemellus superior muscle

a, Insertion of pyriformis muscle
b, Os coccygis
c, Surface of origin of gluteus minimus muscle
d, Insertion of obturator externus muscle

PLATE XVII. *Fig.* 1. (*Continued.*)

e, Trochanter major of os femoris
f, Trochanter minor of os femoris
g, Tubercle of os sacrum, affording attachment to sacro-ischiadic ligaments
x, Origin of gemellus inferior muscle
a, Strong pubic fibres of capsular ligament
1, Bursa mucosa of obturator internus muscle

Fig. 2.

A, Capsular ligament of hip-joint around acetabulum
B, Round ligament of hip-joint
C, Anterior superior spinous process of os ilium
D, Origin of obturator externus muscle
K, Origin of quadratus femoris muscle
R, Synovial gland of hip-joint
S, Crista of os ilium
U, Obturator ligament

a, Capsular ligament of hip-joint, attached to cervix of os femoris
d, Obturator vein
r, Acetabulum
a, Reflected portion of capsular ligament of hip-joint
b, Head of os femoris
c, Surface of origin of gluteus minimus muscle
d, Obturator artery
t, Anterior inferior spinous process of os ilium
𝔘, Neck of os femoris

1, Cartilaginous brim of acetabulum
10, Ligamento-cartilaginous brim of acetabulum
21, Obturator nerve

PLATE XVIII. *Fig.* 1.

H, Long sacro-ischiadic ligament
s, Crista of os ilium
z, Tuberosity of os ischium

b, Crucial ligaments of vertebræ
h, Short sacro-ischiadic ligament
q, Lacertus ligamentosus

b, Os coccygis
f, Sacro-iliac synchondrosis
h, Intertransverse muscle
i, Ligamenta vaga

Fig. 2.

H, Long sacro-ischiadic ligament
s, Crista of os ilium
z, Tuberosity of os ischium

a, Ligamentous expanse of os coccygis
g, Interspinous ligament
h, Short sacro-ischiadic ligament
k, Ilio-lumbar and ilio-sacral ligaments

b, Os coccygis
g, Tubercle of os sacrum, affording attachment to sacro-ischiadic ligaments
i, Ligamenta vaga
f, Posterior superior spinous process of os ilium
z, Ilio-sacral ligaments

2, Capsular ligaments of articular processes of vertebræ

Fig. 3.

c, Capsule of head of rib

a, Common anterior ligament of vertebræ

PLATE XIX. *Fig.* 1.

Y, Patella

d, Attachment of patellar ligament to tubercle of tibia

d, Apex of patella
l, Cellular envelope of vastus internus muscle, incorporated with fascia lata

o, Cellular envelope of vastus externus muscle, incorporated with fascia lata
y, Patellar ligament

y, Bursa mucosa, under patellar ligament

3, External lateral ligament of knee-joint

Fig. 2.

M, Internal condyle of os femoris
N, External condyle of os femoris

m, Tibial surface of patella, opposed to *m* of os femoris
n, Fibular surface of patella, opposed to *n* of os femoris

m, Trochlear surface opposed to patella

n, Trochlear surface opposed to patella

1, Bursa mucosa, beneath crureus and rectus muscles
3, External lateral ligament
4, Capsular ligament
5, Patella
7, Synovial gland
8, Mucous ligament
9, Synovial glandular tissue
10, Alar ligaments

PLATE XX. *Fig.* 1.

A, Flexor longus pollicis pedis
D, Os calcis
E, Tendon of sartorius muscle
F, Peroneus longus muscle
I, Peroneus brevis muscle
K, Vaginal ligament of peronei muscles
M, Tendon of semi-tendinosus muscle

N, Tendon of semi-membranosus muscle
O, Flexor longus digitorum pedis muscle
Q, Tendon of gracilis muscle
R, Gastrocnemius externus muscle
U, Plantaris muscle
V, Popliteus muscle

PLATE XX. *Fig.* 1. (*Continued.*)

a, Tibialis posticus muscle
o, Tendon of flexor longus digitorum pedis muscle
r, Gastrocnemius internus muscle
u, Tendon of plantaris muscle

e, Bursa mucosa, common to tendinous insertions of sartorius, gracilis, and semitendinosus muscles
l, Tendon of biceps flexor cruris muscle

m, Tibial condyle of os femoris
r, Tendo achillis
s, Malleolus internus

a, Vaginal ligament of flexor longus pollicis pedis
o, Vaginal ligament of the flexor muscles of the toes

2, Internal lateral ligament of knee-joint
10, Popliteal ligament

Fig. 2.

M, Internal condyle of os femoris
N, External condyle of os femoris

a, Head of tibia
c, Depressions on head of tibia
y, Patellar ligament

4, Capsular ligament of knee-joint
9, Synovial tissue
11, Anterior crucial ligament
12, Posterior crucial ligament
13, Internal semilunar cartilage
14, External semilunar cartilage
15, Transverse ligament of semilunar cartilages

Fig. 3.

M, Internal condyle of os femoris
N, External condyle of os femoris

a, Head of tibia

4, Capsular ligament of knee-joint
9, Synovial tissue
11, Anterior crucial ligament
12, Posterior crucial ligament

PLATE XXI. *Fig.* 1.

A, Flexor longus pollicis muscle
B, Origin of abductor pollicis muscle
C, Origin of flexor brevis digitorum muscle
D, Os calcis
F, Abductor minimi digiti pedis muscle
G, Musculus accessorius ad flexorem longum digitorum
H, Interosseous ligament
I, Peroneus brevis muscle
N, Flexor brevis minimi digiti pedis muscle
O, Flexor longus digitorum pedis muscle
R, Origin of internal head of gastrocnemius externus muscle
V, Popliteus muscle
X, Flexor brevis pollicis pedis muscle

a, Tibialis posticus muscle
b, Insertion of abductor pollicis muscle
k, Lumbricales muscles
o, Tendon of flexor longus digitorum muscle

a, Tendon of flexor longus pollicis pedis muscle
b, Os naviculare
c, Tendons of flexor brevis digitorum pedis muscle
n, Outer condyle of os femoris
o, Tendons of flexor longus digitorum pedis muscle
s, Malleolus internus

A, Vaginal ligament of flexor longus pollicis muscle

1, Fibula
2, Internal lateral ligament of knee-joint
3, External lateral ligament of knee-joint
4, Vaginal ligaments of the flexor tendons of the toes
10, Popliteal ligament
60, Head of fibula

Fig. 2.

s, Malleolus externus

a, Trochlear surface of astragalus opposed to tibia and fibula
b, Os naviculare
c, Capsular ligament surrounding articulation of os calcis and os cuboides
g, Os cuboides
m, Convex surface of os astragalus opposed to os naviculare
s, Malleolus internus
u, Intertransverse ligament between astragalus and os naviculare and os cuboides
v, Capsular ligament surrounding articulation of astragalus and naviculare
z, Transverse ligament between os calcis and os cuboides

10, Synovial gland
30, Capsular ligament of ankle-joint
31, Anterior fibular ligament of ankle-joint

PLATE XXI. *Fig.* 3.

i, Intertransverse ligaments between tarsal and metatarsal bones
m, Capsular ligament of proximal joint of great toe

b, Os naviculare
d, Os cuneiforme internum
e, Os cuneiforme medium
f, Os cuneiforme externum
g, Os cuboides
l, Capsular ligaments surrounding articulations between tarsal and metatarsal bones
t, Protuberance on proximal extremity of metatarsal bone of little toe
v, Capsular ligament surrounding articulation of os naviculare, and three cuneiform bones
z, Transverse ligaments of tarsal bones

2, Metatarsal bone of index toe
3, Metatarsal bone of middle toe
4, Metatarsal bone of ring toe
5, Metatarsal bone of little toe
6, Proximal phalanx of great toe
20, Metatarsal bone of great toe

PLATE XXII. *Fig.* 1.

D, Os calcis
H, Interosseous ligament
I, Peroneus brevis muscle
L, Transversalis pedis muscle
P, Abductor tertii digiti pedis muscle
Q, Abductor minimi digiti pedis muscle
V, Origin of popliteus muscle

a, Tibialis posticus muscle
e, Transverse ligaments of heads of metatarsal bones

b, Os naviculare
d, Os cuneiforme internum
g, Adductor medii digiti pedis muscle
i, Indicates point of insertion of popliteus muscle
m, Internal condyle of os femoris
n, External condyle of os femoris
o, Tibia
q, Adductor pollicis muscle
s, Malleolus internus
w, Tibial plantar ligament
x, Transverse plantar ligaments
y, Fibular plantar ligament

1, Fibula
2, Internal lateral ligament of knee-joint
3, External lateral ligament of knee-joint
4, Vaginal ligaments of flexor tendons
10, Popliteal ligament
60, Head of fibula

PLATE XXII. *Fig.* 2.

D, Os calcis

a, Os astragalus
b, Os naviculare
g, Os cuboides
s, Malleolus internus

w, Internal plantar ligament
y, External plantar ligament

33, Deltoid ligament of ankle-joint

PLATE XXIII.

A, Adductor indicis muscle
D, Os calcis
F, Peroneus longus muscle
H, Interosseous ligament
I, Peroneus brevis muscle
K, Vaginal ligament of peronei muscles
M, Abductor medii digiti pedis muscle
P, Abductor tertii digiti pedis muscle
Q, Abductor minimi digiti pedis muscle
T, Abductor indicis muscle

a, Insertion of tibialis posticus muscle
i, Tendon of peroneus brevis muscle
m, Capsular ligaments of proximal joints of toes
n, Lateral ligaments of proximal joints of toes
p, Capsular ligaments of medial and distal joints of toes
q, Lateral ligaments of medial joints of toes

b, Os naviculare
d, Os cuneiforme internum
g, Adductor medii digiti pedis muscle
i, Indicates points of insertion of popliteus muscle
m, Internal condyle of os femoris
n, External condyle of os femoris
o, Tibia
s, Malleolus internus
t, Adductor tertii digiti pedis muscle
w, Tibial plantar ligament
x, Transverse plantar ligaments
y, Fibular plantar ligament

1, Fibula
2, Internal lateral ligament of knee-joint
3, External lateral ligament of knee-joint
5, Transverse ligaments of head of fibula
6, Proximal phalanx of great toe